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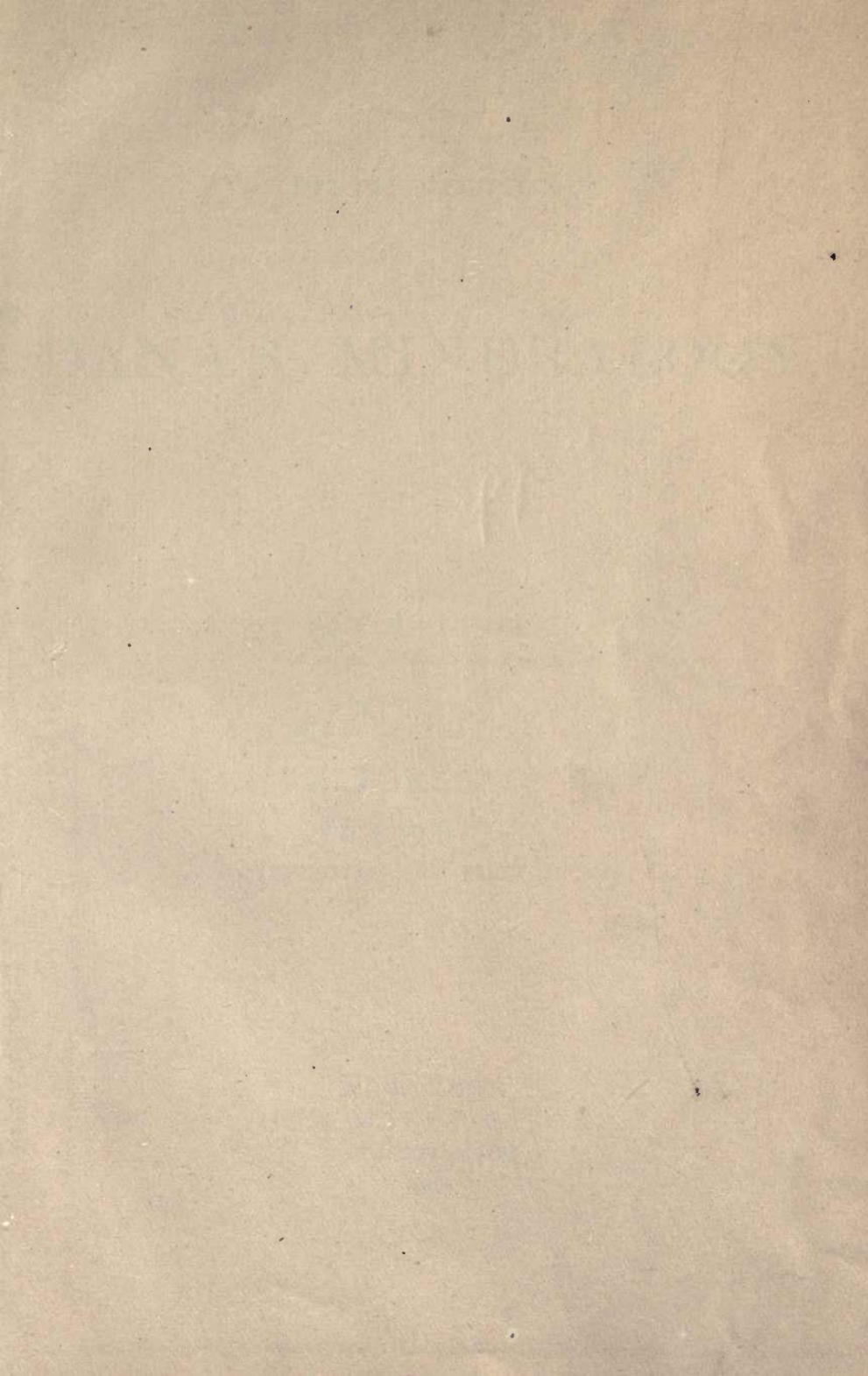
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THIRD APPENDIX

TO THE

FIFTH EDITION

OF

James Dwight
DANA'S MINERALOGY,

BY

EDWARD S. DANA,

CURATOR OF MINERALOGY, YALE COLLEGE.



COMPLETING THE WORK TO 1882.

NEW YORK:
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PREFATORY NOTE.

THIS Third Appendix to the fifth edition of the System of Mineralogy is designed to make the work complete up to January, 1882. Its publication has been unavoidably delayed long after the date originally set for its completion. The fact that seven years have elapsed since the issue of the Second Appendix (March, 1875), will be a sufficient explanation of the perhaps inconvenient length to which it extends.

This Appendix contains: (1), full descriptions of all species announced as new since the publication of Appendix II.; and (2), references to all important mineralogical articles which have been published during the same period, with citations from them of many new analyses and new facts as to physical characters and localities. Under each species the entries are, for the most part, arranged under two heads: that of Crystallization (*Cryst.*), for the articles which treat of the crystalline form; and that of Analyses (*Anal.*), for those containing chemical analyses, with or without other matter.

The number of "new species" is very large, aggregating fully three hundred (300). Unfortunately the original descriptions of a large part of them are very incomplete, and in too many cases the names are contributions only to the nomenclature of the Science. If two very simple rules could be conscientiously followed by those investigating supposed new species, the Science of Mineralogy would be vastly benefited. These are: first, that the material analyzed should in every case be proved by a careful microscopic and chemical examination to be *homogeneous*; and, second, that the thorough investigation which is to establish the position of a "new species" should *precede*, not follow, the giving of a new name. A mineral which can be only partially described does not deserve a name.

In the classified list of new names on p. xi., those which seem to have a fair claim to recognition (including the names of some well-characterized varieties) are placed first. Following these in each division, are given in a paragraph the names, (1), of ordinary varieties having no especially distinctive character; (2), of imperfectly described or doubtful species, for which further study is much to be desired; and (3), of those so-called species which are obviously bad. The names of all species, new and old, are arranged in the body of the work in alphabetical order; the former are printed in black-faced type. References are given both to the System and also to Appendixes I. and II.; Appendix III. is, consequently, an index for the earlier Appendixes.

The Bibliography includes a list of mineralogical works published since January, 1875. To this is added a list of new journals devoted wholly, or in part, to mineralogical subjects, and also a list of memoirs upon a single subject of more than ordinary importance. For the explanation of *Abbreviations*, see the System, pp. xxxv.-xlv., and also this Introduction, p. viii. The thanks of the writer are due to Professor George J. Brush for his kindness in reading a set of the proofs as the work was going through the press.

NEW HAVEN, April 1st, 1882,

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V.—MEMOIRS ON THE "OPTICAL ANOMALIES" OF SOME CRYSTALLIZED MINERALS.

The question as to the true explanation of the "optical anomalies" presented by many crystallized minerals has been widely discussed in the past few years. That the crystals of many species exhibit in polarized light optical phenomena, not in harmony with their apparent geometrical form, has long been recognized; and the explanations which have been offered in earlier years are well understood: that is, the theory of lamellar polarization of *Biot*, of internal tension of *Reusch*, of disturbed molecular structure of *Marbach*, and so on. The recent discussion of this subject has taken a wide range, and many new facts have been recorded. Attention has been especially directed to it by the classical memoir of *Mallard*, the importance of which cannot be overestimated, even if his conclusions are not always accepted (for title see below). According to *Mallard's* view, as far as

it can be explained in a word, these optical anomalies are explained on the assumption that the crystal exhibiting them is in fact made up of separate individuals regularly grouped, which are of a lower grade of symmetry than that which the complete form simulates. Thus, an apparent isometric cube may be made up of 6 square pyramids, each optically uniaxial, placed with their vertices at the centre of the solid, and their bases forming its sides. Similarly an apparent isometric octahedron may be made up of eight anisotropic triangular pyramids grouped in an analogous manner; and so on. Mallard thus includes under *pseudo-isometric* species: alum, analcite, boracite, fluorite, garnet, and senarmontite; among the *pseudo-tetragonal* species: apophyllite, brookite, mellite, octahedrite, rutile, vesuvianite, zircon; among *pseudo-hexagonal* species: apatite, beryl, corundum, penninite, ripidolite, tourmaline; *pseudo-orthorhombic* species: harmotome, topaz; *pseudo-monoclinic*, orthoclase (microcline). Many additional facts to which the hypothesis of Mallard is applicable have been published by *Bertrand* (see below, and under the various species in the body of this work), who has also devised an arrangement of the microscope by means of which, with a high magnifying power, optical investigations may be made in many cases where it was before impossible. *Grattarola* includes calcite, quartz, nephelite, barite, etc. in the list of species which have an apparent symmetry higher than that which really belongs to them; his conclusions, however, are not based upon observations.

In many other cases observers have, on the basis of variation in angles, or of optical characters, reached the conclusion that the species in question really belongs to a system of lower symmetry than that to which it has been ordinarily referred. These cases are recorded in Appendixes II. and III. These last named observations, however, do not in most cases admit of being explained on the hypothesis of Mallard. In many of them the conclusions reached are beyond doubt correct, in others the question must be regarded as still undecided.

Tschermak proposes the term *mimetic* for those forms ("mimetische Formen"), which imitate a higher grade of symmetry by the grouping (twinning) of individuals of a lower grade of symmetry, as for example, aragonite.

Mallard's hypothesis has been opposed by various investigators on the ground that it does not explain many observed facts and is decidedly at variance with others. The observations of *Klocke*, *Jannettaz*, *Klein*, *Ben Saude*, are especially to be mentioned. A few of the facts bearing upon the question are given under boracite (p. 17) and analcite (p. 5). *Klocke* shows that the same crystal of alum may contain truly isotropic (normal) and anisotropic (abnormal) portions; also that the so-called distortion of the crystals and their position during their formation influences the optical phenomena observed. He shows, also, that preparations of gelatine, hardened under tension, show all the optical phenomena of the crystals under discussion. This subject cannot be elaborated here; it is enough to say that the observations of the mineralogists mentioned, as also of others, seem to confirm the view of *Reusch*, that at least in many cases (e. g. analcite, garnet, vesuvianite, etc.) the "optical anomalies" are to be explained as due to the state of molecular tension existing within the crystal. The investigation of this subject cannot, however, be regarded as entirely completed. A good general review of this subject is given by *Zirkel* in the 11th edition of *Naumann's Mineralogy*, pp. 152 et seq., also p. 722, 1881. The following are titles of important papers bearing upon this subject.

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RUMPF. Ueber den Krystallbau des Apophyllits, *Min. Petr. Mitth.*, ii., 369, 1879.

TSCHERMAK. "Mimetische Formen," *ZS. G. Ges.*, xxxi., 637, 1879, and *Lehrb. Min.*, p. 89 et seq., 1881.



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APPENDIX III.

Abriachanite. *Heddle*, *Min. Mag.*, iii., 61, 193, 1879. *Aitken*, *ib.* p. 69. "An apparently new mineral," *Jolly and Cameron*, *Q. J. G. Soc.*, xxxvi., 109, 1880.

Amorphous, clay-like; sometimes showing a distinct fibrous structure; also pulverulent. Color bright ultramarine blue. G. = 3.326 *Heddle*; 2.01 *J. and C.* Analyses: 1, *Heddle*, fragments from *Dochfour*; 2, *Heddle*, similar material crushed and then washed by decantation; 3, mean of several analyses from different localities, *Jolly and Cameron*.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O	
1.	51.15	....	14.92	9.80	0.30	10.80	1.12	6.52	0.63	4.77*	S tr. = 100.01.
2.	52.40	....	9.34	15.17	0.40	10.50	1.17	7.11	0.61	1.00	= 100.67.
3.	55.02	3.37	19.03	3.83	....	12.95	2.53	1.74	....	1.45	P ₂ O ₅ 0.33 = 100.25.

* Loss 0.95 at 100° C.

B. B. infusible, but loses color. Occurs abundantly in seams and cavities of the gneiss and granite of the *Abriachan* district, near *Loch Ness*, in *Inverness-shire*, *Scotland*.

[The material examined by *Heddle*, and that analyzed by *Jolly and Cameron*, was derived, at least in part, from the same source, and was similar in appearance; although in specific gravity there is a wide discrepancy, and the analyses do not entirely agree, especially as regards the alkalies. *Heddle's* analysis is near *crocidolite* (compare anal. 3, *Min.*, p. 243). The facts at least prove the correctness of the opinion expressed by *Jolly and Cameron*, that, until a more complete examination can be made on purer material, the substance does not deserve a new name.]

ACANTHITE, *Min.*, p. 51; *App. II.*, p. 1.—*Groth* has described crystals from *Annaberg*, which are orthorhombic with marked monoclinic symmetry, *Min.-Samml.*, *Strassburg*, p. 51, 1878.

Achrematite. *J. W. Mallet*, *J. Chem. Soc.*, II., xiii., 1141, 1875.

Massive, crypto-crystalline. Tetragonal or hexagonal (?). H. = 3-4. G. = 5.965, in powder, 6.178. Color pale sulphur-yellow to orange and red, in the mass liver brown, from admixed limonite. Streak pale cinnamon brown. Lustre resinous to adamantine. Translucent on thin edges. Fracture uneven to subconchoidal. Brittle. Analyses:

	As ₂ O ₅	P ₂ O ₅	MoO ₃	PbO	Pb(for Cl)	Cl	Fe ₂ O ₃	H ₂ O	F, Cu, Ag
1.	15.90	0.02	4.58	60.35	5.51	1.89	9.93	1.63	tr. = 99.81.
2.	16.25	0.03	4.40	62.32	5.48	1.88	8.53	1.38	tr. = 100.27.
3.	15.75	0.02	4.19	56.77	5.48	1.88	13.03	2.27	tr. = 99.44.

The iron and water are present in the amount required for limonite, the presence of which is suggested by microscopic examination; this limonite is deducted, viz., 11.56 p. c. for (1), 9.91 for (2), and 15.35 for (3); then calculating to 100, the results are:

	As ₂ O ₅	MoO ₃	PbO	Pb(for Cl)	Cl
1.	18.02	5.19	68.40	6.25	2.14 = 100.
2.	17.99	4.87	68.99	6.07	2.08 = 100.
3.	18.73	4.98	67.53	6.52	2.24 = 100.
Mean	18.25	5.01	68.31	6.28	2.15 = 100.

The formula calculated is 3 [3Pb₃As₂O₈ + PbCl₂] + 4 [Pb₃MoO₅]. [That the mineral is homogeneous, and not a mixture of an arsenate and molybdate of lead, is considered by the author as sufficiently proved; but the composition proposed is certainly not a probable one]. B. B., decrepitates slightly, turns dark brick-red, and fuses easily to a nearly

black globule, which shows indistinct crystalline facets on cooling. On charcoal yields arsenical odors, a lead coating, and finally globules of lead. With the fluxes, reacts for iron, which, however, is only present as an impurity.

From the mines of Guanaceró, Chihuahua, Mexico. Named from *ἀχρῖμακτος*, *useless*, in allusion to the fact that it was received as a silver ore, while, in fact, of no intrinsic value.

ACHTARAGDITE.—Min., p. 478; App. II., p. 1.

ACMITE, Min., p. 224; App. II., p. 1.—Anal. and discussion of composition, Norway, *Döller*, Min. Petr. Mitth., i., 379, 1878.

Probable occurrence at Ditró, Transylvania, *Becke*, Min. Petr. Mitth., i., 554, 1878.

ADAMITE, Min., p. 565.—From the ancient mines recently reopened at Laurium, Greece.—Occurrence announced, *Klien*, J. Min., 1878, 53; cryst. and optical description, *Des Cloizeaux*, C. R., lxxxvi., 88, Jan., 1878; cryst. description, *Laspeyres*, Z. Kryst., ii., 147, Feb., 1878; *Des Cloizeaux*, Bull. Soc. Min., i., 30, May, 1878.

Occurs in small crystals, colorless to deep emerald green, implanted on smithsonite; also in radiated mammillary groups. The forms, as shown independently by *Des Cloizeaux* and *Laspeyres*, are closely similar to those of the original mineral from Chili, as also that from Cape Garonne (App. II., p. 1). *Laspeyres* finds that, with identical prismatic angles, the vertical axes in the colorless and deep green crystals differ, as 20 : 19 respectively; the habit is also different. An analysis of the green mammillary variety gave *Friedel* (Bull. Soc. Min., i., 31) As₂O₃ 40·17, ZnO 55·97, CuO 0·64, FeO 0·18, H₂O 4·01 = 100·97.

ÆGIRITE, Min., p. 223; App. II., p. 1.—Anal., Hot Springs, Arkansas, *J. L. Smith*, Am. J. Sc., III., x., 60, 1875. Analysis and discussion of composition, *Döller*, Min. Petr. Mitth., i., 374, 1878.

Æsirite. *v. Lasaulx*, J. Min., 1876, 352; *Des Cloizeaux*, ib., 1877, 60 (Bull. Soc. Min., i., 125, 1878). A compact, earthy mineral, of a bright blue color, from the Pyrenees. H. = 3-4, G. = 3·018. Shown by *Des Cloizeaux* to be a heterogeneous mass, consisting of a blue paste, inclosing different minerals, perhaps owing its blue color to artificial means. Analyses: 1, *Lasaulx* (see also J. Min., 1877, 60); 2, *id.*, part (18·23 p. c.) soluble in HCl (in other trials 29·17 p. c., and 32·45 p. c., went into solution); 3, *Damour*; 4, *id.*, insoluble portion; 5, *id.*, soluble portion; 6, total of 4 and 5; 7 and 8, *Rammelsberg*, ZS. G. Ges., xxviii., 234, 1876.

	SiO ₂	Al ₂ O ₃	Mn ₂ O ₃	Fe ₂ O ₃	FeO ¹	MgO	CaO	K ₂ O	H ₂ O	
1.	48·53	7·55	1·17	32·78	0·90	3·59	....	6·16	= 100·67.	
2. Sol.	11·85	20·86	2·83	52·37	0·41	11·57	....	....	= 99·89.	
3.	45·36	10·22	....	13·67	....	....	....	8·23		
4. Insol.	31·57	3·58	....	5·27	3·55	3·61	1·01	....	TiO ₂ 0·41, V ₂ O ₅ tr. = 49.	
5. Sol.	12·88	8·22	....	7·43	2·31	6·55	0·30	12·74,	V ₂ O ₅ , P ₂ O ₅ tr. = 50·43.	
6.	44·45	11·80	....	12·70	5·86	10·16	1·31	12·74,	TiO ₂ 0·41, V ₂ O ₅ , P ₂ O ₅ tr. =	[99·43.
7. G. = 2·670	42·92	15·34	....	7·12	3·16	2·45	15·80	....	12·67 = 99·06.	
8.	44·00	15·39	....	8·88	3·16	2·44	13·88	....	13·00 = 100·75.	

[It seems to be sufficiently proved that the substance above described is not to be regarded as a mineral species.]

ÆRUGITE.—App. II., p. 1.

ÆSCHYNITE, Min., p. 522.—Cryst., Hitterö, Norway, *Brögger*, Z. Kryst., iii., 481, 1879. Miask, an analysis has afforded *Rammelsberg* (ZS. G. Ges., xxix., 815, 1877),

Cb ₂ O ₅	TiO ₂	ThO	(Ce, La, Di) ₂ O ₃	Y ₂ O ₃	Er ₂ O ₃	Fe ₂ O ₃	CaO
32·51	21·20	17·55	19·41	3·10	3·71	2·50	= 99·98.

The formula deduced from this is [R₂]Cb₂(Ti, Th)₃O₁₄, or [R₂]Cb₂O₅ + 3(Ti, Th)O₂.

Aglaite.—See *Spodumene*, p. 112.

AGRICOLITE.—App. II., p. 1.

Ajkite. A resin near amber, Ajka, Hungary (Bull. Soc. Min., i., 126, 1878).

ALABANDITE, Min., p. 46.—*Anal.*, Morococha, Peru, *Raimondi*, Min. Pérou, p. 239, 1878.

Alaskaite. *G. A. König*, Am. Phil. Soc., Philad., 1881, 472, or *Z. Kryst.*, vi., 42.

Massive, small foliated, with occasional cleavage planes. *G.* = 6.878. Lustre metallic. Color whitish lead-gray. Powder bluish gray. Opaque. Easily friable in the mortar. Analyses: 1; 1*, after deducting from (1) 2.28 p. c. chalcopyrite, and 15 p. c. barite; 2, independent variety.

	S	Bi	Sb	Pb	Ag	Cu	Fe	Zn	Insol.
1 (3)	15.85	46.87	0.51	9.70	7.10	3.64	0.70	0.64	15.00 = 100.01.
1*	17.63	56.97	0.62	11.79	8.74	3.46	....	0.79	.... = 100.
2 (3)	17.85	51.35	....	17.51	3.00	5.38	1.43	0.20	2.83 = 99.55.

For (1³) the ratio of R : Bi : S = 1 : 2.02 : 4.14, and for (2) after deducting as in (1) = 1 : 1.89 : 3.88, or, approximately 1 : 2 : 4, corresponding to (R₂, R) S + Bi₂S₃, with R₂ = Ag₂, Cu₂, and R = Pb.

B. B. in closed tube decrepitates, and melts without giving a sublimate; in the open tube gives fumes of SO₂ and a slight sublimate of Sb₂O₃. On charcoal a lead coating, and on continued blowing that for silver; also with potassium iodide and sulphur, a strong reaction for bismuth. After roasting reacts for copper and iron with the fluxes. Slowly attacked by cold concentrated HCl, rapidly decomposed by the hot acid, leaving flocculent silver chloride.

Occurs intimately mixed with quartz, barite, chalcopyrite, and tetrahedrite, at the Alaska mine, Poughkeepsie Gulch, Colorado.

Rammelsberg (ZS. G. Ges., xxix., 80, 1877) has described under the name of SILBERWIS-MUTHGLANZ, a mineral which is the bismuth compound corresponding to miargyrite, and is very near alaskaite.—Massive, soft. *G.* = 6.92. Color gray. Streak light gray. Analysis (3) after deducting admixed galenite: S 17.24, Bi 54.50, Ag 28.26 = 100. This corresponds to AgBiS₂, or Ag₂S + Bi₂S₃, requiring S 17.0, Bi 54.7, Ag 28.3 = 100. B. B. on charcoal fuses readily, giving a coating of bismuth oxide, and after long blowing a globule of silver. Soluble in HNO₃ with separation of sulphur. Associated with tetrahedrite, galenite, sphalerite and pyrite at the Matilda mine, near Morococha, Peru. [The two minerals above described are essentially identical, and as the name of Rammelsberg cannot be employed outside of Germany, that of König may be accepted to cover both. The corresponding mineral, miargyrite, has also some varieties which contain lead.]

ALBITE, Min., p. 348; App. II., p. 1.—*Cryst.* Kuchelbad, near Prague, Bohemia, *Vrba*, Ber. Böhm. Ges., 1879, 472, and *Z. Kryst.*, iv., 360, 1880. Switzerland, *von Rath*, *Z. Kryst.*, v., 27; *Zöptau*, *ibid.*, v., 253, 1880. Mt. Cau., Pyrenees, *v. Lasaulx*, *Z. Kryst.*, v., 341, 1881.

Thermo-electrical characters, *Hankel*, Wied. Ann., i., 283, 1877.

Made artificially, identical in form and composition with natural crystals, *Hautefeuille*, C. R., lxxxiv., 1301, 1877.

Anal. (2.3 p. c. K₂O), Guatemala, *v. Lasaulx*, J. Min., 1875, 147.

Pseudomorph after spodumene (q. v., p. 112).

See also *Feldspar Group*, p. 45.

ALLANITE, Min., p. 285; App. II., p. 2.—Analyses of alteration products produced by weathering, *J. R. Santos*, Chem. News, xxxviii., 95, 1878.

ALLOPHANE, Min., p. 419; App. II., p. 2.—*Anal.*, Steinbrück, *Gamper*, Verh. Geol. Reichs., 1876, 354.

Muck describes (Z. Berg.-Sal.-Wesen., xxviii., 192, 1880) an earthy, white to pale wine yellow, or greenish yellow substance, from the clay of the Schwelm mine. It corresponds with the *kieselaluminite* of Koruwestheim (Min., p. 420), but the name SULFATALLOPHAN

is preferred, as it behaves like allophane. Soluble in HCl. Analyses : 1, yellowish, translucent ; 2, white, earthy ; 3, soft, of butter-like consistency ; 4, kieselaluminite.

	SiO ₂	Al ₂ O ₃	SO ₃	H ₂ O
1.	14·84	38·55	7·98	38·63.
2.	18·74	36·73	6·04	38·49.
3.	21·83	40·07	10·54	27·52.
4.	13·06	42·59	5·04	39·32.

As remarked by Muck, these substances are varying mixtures of aluminum silicate and basic aluminum sulphate.

ALLOPHITE.—App. II., p. 2.

Alshedite.—See *Titanite*, p. 122.

ALTAITE, Min., p. 44; App. II., p. 2.—From Chili, *Domeyko*, C. R., lxxxi., 632, 1875, and 5th App. Min. Chili, p. 50, 1876.

ALUM, Min., p. 651.—Apparent tetrahedrism due to distortion, *Wulff*, Z. Kryst., v., 81, 1880.

Containing Cs and Rb, from Vulcano, *Cossa*, Accad. Linc. Trans., III., ii., 34, 1878. Action of solvents upon, etc., *Klocke*, Z. Kryst., ii., 126, 293, 553 ; iv., 76. See also *L. de Boisbaudran*, C. R., lxxx., 888, 1007, 1450, 1875. *Uzielli*, Accad. Linc. Trans., III., i., March 18, 1877.

ALUMINITE, Min., p. 658 ; App. II., p. 2.—**Anal.**, Mühlhausen, near Kralup, *Raffelt*, Jahrb. Geol. Reichs., 1878, 360.
See also *Werthemanite*, p. 131.

ALUNITE, Min., p. 658.—**Anal.**, Breuil, Auvergne, *v. Lasaulx*, J. Min., 1875, 142. In large deposits at Madriat, d'Issoire, France, analyses, *Rev. Geol.*, Delesse and Lapparent, xiii., 38, 1877.

ALUNOGEN, Min., p. 649; App. II., p. 2.—**Anal.**, Cerros Pintados, Tarapaca, Peru, *Raimondi*, Min., Pérou, 243, 1878. Celebes, East Indies, *Frenzel*, Min. Petr. Mitth., iii., 295, 1880. Scotia mine, Cumberland Co., N. S., *F. D. Adams*, Geol., Canada, 1879–80. Sierra del Atajo, and Cerro de Famatina, Argentine Republic, *Brackebusch*, Min. Argentin., 76, 1879. Wallerawang, New South Wales, *Liversidge*, Proc. R. Soc., N. S. W., Nov. 3, 1880.

ALVITE, Min., p. 511.—According to a suggestion of *W. C. Brögger* (Geol. För. Förh., v., 352, 1881), alvite is to be regarded as simply zireon and xenotime, compounded as described by *Zschau* (Min., p. 529). Crystals from Änneröd, near Moss, Norway, gave him 36·58 SiO₂ and 18·84 P₂O₅, supporting this view. [This may be true of some so-called alvite, but can hardly apply to the mineral originally analyzed by *Forbes*.]

AMALGAM, Min., p. 13; App. II., p. 2.—*Domeyko* (3d Ed. Min., Chili, p. 358, 1879) describes several varieties of silver amalgam from Chili. One of these from the mines of Arqueros, Coquimbo, Chili, has Ag 94·4, Hg 5·6, and corresponds to *kongsbergite* (App. II., p. 32). Another has Ag 69·21, Hg 30·76, and is called *bordosite* (but see App. II., p. 8) from the locality, the mines of Bordos. Various intermediate compounds are mentioned.

An amalgam from Vitale Creek, British Columbia, lat. 53° N., afforded : Ag 86·15, Hg 11·90, SiO₂ 0·45 = 98·50 (*Hanks*, priv. contrib.); it hence corresponds with *arquerite* (Min., p. 14). An amalgam from the Sala mine, Sweden, gave *Nordström* : Ag 46·30, Hg 51·12, Fe 0·81, Zn, Pb, tr., CaCO₃ 0·21, insol., 1·01 = 99·45, Geol. För. Förh., v., 715, 1881.

AMBLYGONITE, Min., p. 545.—Analyses by *Penfield*, Am. J. Sc., III., xviii., 295, 1879.

	P ₂ O ₅	Al ₂ O ₃	L ₂ O	Na ₂ O	H ₂ O	F	
1. Penig, (½)	48.24	33.55	8.97	2.04	1.75	11.26	Mn ₂ O ₃ 0.13 = 105.94, deduct 4.74 O (= F) = 101.20.
2. Montebraz, A. (½)	47.09	33.22	7.92	3.48	2.27	9.93	CaO 0.24 = 104.15, deduct 4.02 O = 100.13. G. = 3.088
3. Auburn, Me. (½)	48.48	33.78	9.46	0.99	3.57	6.20	= 102.48, deduct 2.61 O = 99.87. G. = 3.059
4. Hebron, Me., A.	[48.53]	34.12	9.54	0.34	4.44	5.24	
5. Paris, Me. (½)	48.31	33.68	9.82	0.34	4.89	4.82	K ₂ O 0.03 = 101.89, deduct 2.03 O = 99.86. G. = 3.035
6. Hebron, Me., B. (½)	47.44	33.90	9.24	0.66	5.05	5.45	= 101.74, deduct 2.29 O = 99.45. G. = 3.032
7. Branchville, Ct. (½)	48.80	34.26	9.80	0.19	5.91	1.75	Fe ₂ O ₃ 0.29, Mn ₂ O ₃ 0.10 = 101.10, deduct 0.74 O = 100.36. G. = 3.082
8. Montebraz, B. (½)	48.34	33.55	9.52	0.33	6.61	1.75	CaO 0.35 = 100.45, deduct 0.74 O = 99.71. G. = 3.007

These analyses are arranged so as to show the variation in the relative amounts of water and fluorine. For all of them the author shows that the ratio of P : Al : R : (F, OH) = 1 : 1 : 1 : 1 nearly, corresponding to the formula $Al_2P_2O_8 + 2R(F, OH)$. The conclusion reached is that the varieties (see *hebronite* and *montebrazite* in Appendixes I. and II.) differ only in the extent to which the fluorine is isomorphously replaced by hydroxyl (HO). See also *triploidite*, in this Appendix.

Occurrence at Montebraz, with analyses, *Thenard*, *Monit. Scientif.*, III., ix., 1175 (*Jahresb. Ch.*, 1879, 1204).

AMBLYSTEGITE.—App. I., p. 1.

AMBROSINE.—App. I., p. 1.

Amesite.—See *Corundophilite*, p. 31.

AMPHIBOLE, Min., p. 232; App. II., p. 2.—Cryst. description, *v. Kokscharof*, *Min. Russl.*, viii., 159, 247, 1881.

Practical determination by optical methods in thin sections of rocks, *Fouqué* and *Lévy*, *Ann. Min.*, VII., xii., 429, 1877; *Thoulet*, *ib.*, xiv., 111, 1878.

Analyses of Scottish varieties, and discussion of results of alteration, *Heddle*, *Trans. Soc. Edinb.*, xxviii., 502, 1878. *Amelia Co.*, Va., *Massie*; *Amherst Co.*, Va., *Baker*, *Ch. News*, xlii., 194, 1880.

A variety of amphibole containing no magnesia is called BERGAMASKITE, by *Lucchetti* (*Mem. Acc.*, Bologna, IV., ii., 397, 1881; *Z. Kryst.*, vi., 199). Occurs in a quartzose hornblende-porphry, from Monte Altino, Province of Bergamo, Italy. Forms acicular crystals, vertically striated, and arranged in parallel or radiated groups; cleavage prismatic, 124°. G. = 3.075. Analysis: (½) SiO₂ 36.78, Al₂O₃ 15.13, Fe₂O₃ 14.46, FeO 22.89, CaO 5.14, MgO 0.93, Na₂O 4.00, K₂O 0.42, loss [0.25], MnO tr. = 100; characterized by the small amount of magnesia present.

A manganesean (1.37 p. c. MnO) variety from Edwards, St. Lawrence Co., N. Y.; was described under the name HEXAGONITE, as "a new hexagonal bisilicate," by *Goldsmith* (*Proc. Acad. Nat. Sc.*, Philad., 1876, 160). Its true character was shown by *König* (*ib.*, p. 180).

Bertels (*Verh. Würzb. Ges.*, II., viii., in *Jahresb. Ch.*, 1874, 1267) has given the name PHÄACTINITE to an alteration product of amphibole, forming radiated masses, doubly refracting. H. = 2. G. = 2.997-3.057. Color dirty grayish brown. Analysis after deducting a little magnetite: SiO₂ 35.5, Al₂O₃ 16.9, Fe₂O₃ 25.4, MnO 1.4, MgO 5.3, CaO 7.2, H₂O 8.1 = 99.8, corresponding approximately to R₂[R₁]₂Si₄O₁₆ + 3 aq. From the rock called by the same author isenite, occurring in Nassau, Germany. [An uncertain decomposition product hardly deserves a distinct name; the substance is not very far from delessite.]

ANALCITE, Min., p. 492; App. II., p. 2.—Cryst., *Kerguelen Is.*, *v. Lasaulx*, *Z. Kryst.*, i., 204, 1877. *Radauthal*, *Lüdecke*, *Z. gesamt. Nat.*, III., iv., 325, 1879.

Anal., Montreal, Canada, *Harrington*, *Geol. Canada*, 1878. Bohemia, *Preis* and *Vrba*, *Ber. Böhm. Ges.*, 1879, 467.

Bamberger shows (*Z. Kryst.*, vi., 32, 1881) that Bechi's picranalcite is identical with ordinary analcite, containing only a trace of magnesia.

The question as to the CRYSTALLINE SYSTEM of analcite has been recently discussed, as follows: *Schrauf* (*Anzeig. Ak. Wien*, 1876), referred crystals from Friedeck, Bohemia, to the orthorhombic system, describing them as complex twins, analogous to those of leucite described by vom Rath. *Mallard* (*Ann. Min.*, VII., x., 111, 1876) describes the optical anomalies of the species, and explains them by assuming that a crystal is formed by the interpenetration of three pseudo-tetragonal individuals, each one of which is formed of two orthorhombic crystals, with nearly equal axes; these 24 orthorhombic crystals, composing a single pseudo-isometric crystal, correspond to the 24 planes of a tetrahexahedron. *Lasaulx* (*J. Min.*, 1878, 510) describes the results of an optical examination of crystals of picranalcite from Monte Catini, Tuscany, and concludes (but see below) that they can be only explained by the assumption that a crystal is made up of 12 triclinic individuals interpenetrating each other, analogous to the compound crystals of phillipsite (q. v.). *Schulten* (*Bull. Soc. Min.*, iii., 150, 1880) has obtained trapezohedral crystals by artificial means, and on optical grounds claims for them a complex structure, analogous to that assumed by Mallard (see above); with him, however, the crystals are rhombohedral. Crystals obtained later by a different method were isotropic (*ib.*, v., 7, 1882.)

On the other hand, later investigations by *v. Lasaulx* (*Z. Kryst.*, v., 330, 1881) on crystals from the Cyclopean Is., have led him to the conclusion that the optical phenomena are to be explained (as formerly accepted) by reference to the varying degrees of tension existing in the interior of the crystal. *Arzruni* and *Koch* (*Z. Kryst.*, v., 483, 1881) have also, after a review of the whole subject, and an extended optical examination of specimens, especially from Kerguelen Is. and the Cyclopean Islands, concluded that analcite is to be referred to the isometric system. Finally, the whole subject has been exhaustively reviewed and further investigated by *Ben Saude* (*Inaug. Diss.*, Stuttgart, 1881, and *J. Min.*, 1882, i., 41). He describes the results of an optical examination of sections of many crystals cut parallel to the cubic, octahedral, dodecahedral, and trapezohedral (2-2) planes, and shows that they do not correspond with *Mallard's* hypothesis, but can be explained on the supposition of internal tension. He found, further, that gelatine cast into moulds corresponding to the crystalline forms acquired on solidifying similar optical characters.

ANATASE.—See *Octahedrite*, p. 85.

ANDALUSITE, *Min.*, p. 371; *App. II.*, p. 2.—Optical examination, *Bertrand*, *Bull. Soc. Min.*, i., 94, 1878; *Bertin*, *ibid.*, ii., 54 et seq.

Anal., San Piero, Elba, *Grattarola*, *Boll. Com. Geol.*, 1876, 328.

ANDREWSITE, *App. I.*, p. 1.—Locality described, *Foster*, *Trans. Geol. Soc.*, Cornwall, ix., 1875. Description and *anal.* (*Flight*), *Muskelyne*, *J. Chem. Soc.*, July, 1875, p. 586.

ANGLESITE, *Min.*, p. 622; *App. II.*, p. 3.—*Cryst.*, Erzberg, *v. Zepharovich*, *Lotos*, Dec., 1874. Hungary, *Krenner*, *Z. Kryst.*, i., 321, 1877. Sardinia (list of planes, etc.), *Q. Sella*, *Acc. Linc. Trans.*, III., iii., 150, 1879.

Indices of refraction as affected by change of temperature, *Arzruni*, *Z. Kryst.*, i., 182, 1877.

Recent formation at Bourbonne-les-Bains, *Daubréc*, *C. R.*, lxxx., 604, 1875. Occurrence at Vesuvius, *Scacchi*, *Rend. Acc. Nap.*, Dec., 1877.

ANHYDRITE, *Min.*, p. 621; *App. II.*, p. 3.—*Cryst.*, Berchtesgaden, Bavaria, etc., *Groth*, *Min.-Samml.*, Strassburg, 141, 1878.

Occurrence at Vesuvius, *Scacchi*, *Att. Acc. Nap.*, vi., 1873.

Animikite.—See *Macfarlanite*, p. 71.

ANKERITE, *Min.*, p. 685; *App. II.*, p. 3.—*Anal.*, Phenixville, Penn., *König*, *Proc. Ac. Nat. Sc. Phil.*, 1877, 290.

Boricky has examined a series of minerals from Bohemia, related to ankerite, and discusses the relation in composition between them and other similar carbonates (*Min. Mitth.*, 1876, 47). He writes the general formula $\text{CaFeC}_2\text{O}_6 + x(\text{CaMgC}_2\text{O}_6)$, for all the related minerals, where x may have one of the values $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{4}{5}$, 2, 3, 4, 5, 10; those varieties in which $x < 2$ are included under *ankerite*, and the remainder under the name *parankerite*. For normal ankerite he takes $x = 1$, and for normal parankerite $x = 2$.

Ännerödite, *W. C. Brögger*, Geol. Förh., v., 354, 1881.

Orthorhombic : Axes— $\hat{c} : \hat{b} : \hat{a} = 0.36103 : 1 : 0.40369$. Observed planes $i-\bar{i}$, $i-\bar{i}$, O, I , $i-\bar{3}$, $i-\bar{3}$, $2-\bar{i}$, $\frac{1}{2} \bar{i}$, $1-\bar{i}$, $1, 2, 2-\bar{3}, 2-\bar{2}, 3-\bar{3}$. $I \wedge I = 136^\circ 2'$, $i-\bar{3} \wedge i-\bar{3} = 100^\circ 44'$, $2-\bar{i} \wedge 2-\bar{i} = 58^\circ 25'$. In prismatic crystals of varied habit, often closely resembling columbite; planes sometimes developed according to monoclinic symmetry. Angles near those of columbite (the position taken is that of Schrauf, $I = i-\bar{3}$, *Min.*, p. 516), and also not far from those of polycrase. Twinning plane $i-\bar{5}$. Many crystals often grouped in parallel position, thus forming an apparently single crystal of considerable size.

H. = 6. G. = 5.7 of anhydrous crystals. Lustre metallic to greasy submetallic. Color black. Streak dark blackish brown to brownish or greenish gray. Opaque, or translucent in very thin splinters. Fracture subconchoidal. Brittle. B. B., fuses on the edges to a black glass. Analysis by C. W. Blomstrand :

Cb_2O_5	SnO_3	ZrO_3	SiO_2	ThO_3	Ce_2O_3	Y_2O_3	UO	PbO	FeO	MnO	CaO	MgO	K_2O	Na_2O	Al_2O_3	H_2O
48.13	0.16	1.97	2.51	2.37	2.56	7.10	16.23	2.40	3.38	0.20	3.35	0.15	0.16	0.32	0.28	8.19 = 99.51.

Neglecting the silica, the formula calculated by Blomstrand is $\text{R}_2\text{Cb}_2\text{O}_7 + 2\frac{1}{2} \text{aq.}$, which makes it nearly identical with samarskite, and also to the less certain nohlite (*App. II.*, p. 41), except in the water; Brögger, however, shows that the water is not essential, but is due to a partial alteration which is accompanied by a lowering of the hardness (to 4.5) and specific gravity (to 4.28), and a loss of lustre. A crystal with G. = 5.7 showed only a trace of water. The mineral is consequently hardly to be separated from samarskite in composition, but it is different in form (see E. S. Dana, *Am. J. Sc.*, III., xi., 201, 1876). Brögger shows further, that ännerrödite (euxenite and polycrase) bears the same relation to columbite that samarskite does to tantalite; the two last being very near in form, as are ännerrödite and columbite. From the pegmatite vein at Ännerröd, near Moss, Norway, where it is associated with monazite, alvite (q. v.), apatite, magnetite, beryl, topaz, and other minerals.

Anomite.—See *Mica Group*, p. 77.

ANORTHITE, *Min.*, p. 337; *App. II.*, p. 3.—**Cryst.**, Albani Mts., *Q. Sella*, *Accad. Line.* Mem., III., i., 96, or *Z. Kryst.*, i., 241, 1877. Pesmeda Alp, Monzoni, Tyrol, rose-red variety, *vom Rath*, *Ber. nied. Ges. Bonn.*, July 2, 1877; anal. by *Gamper*, *Verh. geol. Reichs.*, 1877, 134. Aranyer Berg, Transylvania, *vom Rath*, *Z. Kryst.*, v., 23, 1880. Mt. Etna (cyclopite) v. *Lasaulx*, *Z. Kryst.*, v., 326, 1880.

Expansion of crystals with heat, *Beckenkamp*, *Z. Kryst.*, v., 441, 1881.

Pseudomorph, Franklin Furnace, N. J., *Röpper*, *Am. J. Sc.*, III., xvi., 364, 1878.

The esmarkite from Kjörrestad, in Bamle, Norway, is regarded by Brögger and Reusch (*ZS. G. Ges.*, xxvii., 676, 1875) as probably a distinct species, although they show that it follows the same twinning laws as the anorthite of Vesuvius. For Des Cloizeaux's results see *App. II.*, p. 19.

See also *Feldspar Group*, p. 45, and *Barsowite*, p. 12.

ANTHOPHYLLITE, *Min.*, p. 231; *App. II.*, p. 3.—**Opt. exam.**, Bamle, Norway, *Des Cloizeaux*, *C. R.*, lxxxiv., 1473, 1877. *Pisani* (*C. R.*, lxxxiv., 1510) has analyzed the Bamle mineral (1), and also (2) the *snarumite* of Breithaupt (*Min.*, p. 316). *Des Cloizeaux* (l. c.), in view of these analyses, and also of the relation in optical character, suggests that the snarumite may be an alteration product of an aluminous anthophyllite. Analysis 3 (by Rosenius) and 4 (by Stadius) are of an orthorhombic mineral referred to anthophyllite (G. = 3.022–3.045) from Stansvik, near Helsingfors, Finland, *F. J. Wik* (*Z. Kryst.*, ii., 498, 1878).

	SiO_2	Al_2O_3	FeO	MgO	CaO	$\text{Na}_2\text{O}; \text{K}_2\text{O}$	ign.	
1. Bamle, G. 2.98.	51.80	12.40	3.67	27.60	....	1.44	3.00	= 99.01.
2. Snarum	57.90	13.55	1.90	19.40	0.87	4.50	2.86	= 100.98.
3. Stansvik	51.74	8.55	20.35	16.45	1.79	0.41 MnO	....	= 99.29.
4. Stansvik	52.05	9.46	20.72	17.24	1.35	0.26 MnO	....	= 101.08.

ANTILLITE.—*App. I.*, p. 1.

ANTIMONY, *Min.*, p. 18.—Description of artificial crystals, *Laspeyres*, *ZS. G. Ges.*, xxvii., 574, 1875.

APATITE, Min., p. 530; App. II., p. 3.—**Cryst.**, from different localities, *Groth*, Min. Samml., Strassburg, 174, 1878. Lama dello Spedalaccio, *Uzielli*, Accad. Linc. Mem., i., 159, 1876.

According to *Mallard* (Ann. Min., VII., x., 147, 1876), apatite is to be regarded as pseudo-hexagonal, being formed by the intergrouping of orthorhombic individuals; a thin section of a Schlaggenwald crystal showed three irregularly joined sectors, of different optical orientation, and each distinctly biaxial; others from Estremadura, Spain, showed six sectors, two opposite belonging to the same crystal. In other cases normal uniaxial characters were observed and explained by the intimate union of the different molecular aggregations.

Etching figures corresponding to the pyramidal hemihedrism, *Baumhauer*, Ber. Ak. München, 1875, 169. Pyro-electrical characters, *Hankel*, Wied. Ann., vi., 52, 1879. Absorption bands in spectrum (Ce, La, Di), *Cossa*, Accad. Linc. Mem., III., iii, 17 et seq., 1878.

Analyses, etc. Occurrence at Kjørrestad, Bamle, Norway, *Brøgger* and *Reusch*, ZS. G. Ges., xxvii., 646, 1875. Nischne Novgorod (phosphorite), v. *Möller*, Verh. Min. Ges. St. Pet., II., xii., 61. Method of occurrence in Canadian veins, often of immense size, *Harrington*, Geol. Canada, 1878; composition of Canadian apatites, *C. Hoffmann*, Geol. Canada, 1879.

Siewert (Z. Gesamt. Nat., II., x., 339, 1874) found 6·7 p. c. MnO in an apatite from San Roque, near Cordoba, Argentine Republic, and calls this variety, in which part of the calcium is replaced by manganese, MANGANAPATITE. *Penfield* (Am. J. Sc., III., xix., 367, 1880) has analyzed apatites from Branchville, Conn., and Franklin Furnace, N. J., containing manganese; one variety from Branchville afforded 10·59 p. c. MnO.

APHROSIDERITE, Min., p. 502; App. II., p. 3.—Striegau, Silesia, *Websky* (anal. by Rammelsberg), ZS. G. Ges., xxxi., 211, 1879.

APHTHALITE, Min., p. 615; App. II., p. 3.—Vesuvius, *Scacchi*, Atti Acc. Nap., Dec., 1873 (Contr. Min., ii., 48).

APHTHONITE.—See *Tetrahedrite*, p. 120.

APOPHYLLITE, Min., p. 415; App. II., p. 3.—**Cryst.**, Radathal, Harz, *Lüdecke*, Z. Kryst., iv., 626, 1880. Utö, Sweden, *Seligmann*, J. Min., 1880, i., 140.

Pyro-electrical characters, *Hankel*, Pogg. Ann., clvii., 163, 1876.

Mallard (Ann. Min., VII., x., 121, 1876) argues that the true form of apophyllite is monoclinic, and that the crystals are only pseudo-tetragonal. *Rumpf* (Min. Petr. Mitth., ii., 369, 1879) has reached a similar conclusion. *Klocke* (J. Min., 1880, ii., 11, ref.), however, opposes the view of Rumpf, shows in what respects his argument is inconclusive, and explains otherwise more satisfactorily the optical anomalies. See also remarks by *Groth*, Z. Kryst., v., 376., 1881.

Anal. Cipite-Alpe, *Mattesdorf*, Verh. G. Reichs., 1876, 32.

AQUACREPITITE.—App. I., p. 2.

ARAGONITE, Min., p. 694; App. II., p. 4.—**Cryst.**, monograph, v. *Kokscharof*, Min. Russl., vi., 261, 1875. Eisenerz and Hüttenberg, v. *Zepharovich*, Ber. Ak. Wien, lxxi., 253, 1875. Oberstein a. d. Nahe, *Laspeyres*, Z. Kryst., i., 202, 1877; ib., iv., 433, 1880.

Anal. 7·29 PbCO₃, Austin Mine, Wythe Co., Va., *Dunnington*, Proc. Am. Ch. Soc., ii., 14, 1878.

On surface of meteoric iron, anal., *J. L. Smith*, Am. J. Sc., III., xii., 107, 1876.

ARAGOTITE, App. II., p. 4.—Optical examination, *Bertrand*, Bull. Soc. Min., iv., 87, 1881.

Arctolite. ARKTOLITE, *Blomstrand*, "Ett högnordiskt mineral," Geol. Förr. Förrh., v., 210, 1880.

Occurs in a crystalline limestone, forming small irregularly curved crystalline plates, generally compact, occasionally showing prismatic angles of 124°-126° (*Sjögren*, l. c.). H. = 5. G. 3·03. Colorless or yellowish to greenish. Analysis (3): SiO₂ 44·93, TiO₂ 0·38, Al₂O₃ 23·55, Fe₂O₃ 1·24, CaO 13·28, MgO 10·30, Na₂O 1·73, K₂O 0·79, H₂O 3·15 =

99·74. This corresponds to the formula $H_2R_2 [Al_2] Si_3O_{12}$. B. B. fuses with difficulty to a white enamel; partially attacked by acids with the separation of flocculent silica. Found in 1861 on Hvitholm, near Spitzbergen. [A relation to prehnite, on the ground of the composition, and to hornblende, because of the prismatic angle, is suggested, but the mineral needs further examination before its true character can be settled.]

ARDENNITE, App. II., p. 4.—Supplementary description by *v. Lasaulx*, *J. Min.*, 1876, 363, and *Bettendorff*, *Pogg. Ann.*, clx., 126, 1877. Analyses by *Bettendorff*, (1) sulphur-yellow opaque var., G. = 3·656; (2) brown transparent var., G. = 3·643.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	CuO	MgO	CaO	V ₂ O ₅	As ₂ O ₅	H ₂ O	
1.	27·50	22·76	1·15	30·61	0·17	1·38	1·83	0·53	9·33	5·13	= 100·39.
2.	27·84	24·22		26·70	...	3·01	2·17	9·20	2·76	5·01	= 100·91.

It is concluded by *Bettendorff*, that in this mineral arsenic and vanadium replace each other in varying proportions, with a consequent variation in color; in several other trials 1·83, 2·31, 2·53, 2·98, 6·64 p. c. As₂O₅ were found; *v. Lasaulx* (l. c.) shows that the vanadium ardenite is probably the original mineral, and that the presence of the arsenic is due to gradual alteration.

Arequipite.—*A. Raimondi*, *Minéraux du Pérou*, Paris, 1878, p. 167.

Compact, wax-like. H. nearly 6. Color honey yellow. Fracture conchoidal. According to a qualitative analysis, a silico-antimoniate of lead. B. B. on charcoal fuses with difficulty, yielding buttons of lead, and gives off antimonial vapors. Slightly attacked by nitric acid, dissolves slowly in hydrochloric acid to which a little nitric has been added, and leaves a residue of silica. Occurs sparingly in a quartzose gangue, with argentiferous lead carbonate and chrysocolla, at the Victoria mine, Montagne de la Trinité, near Tibaya, Province of Arequipa, Peru. [Needs further examination, probably a mixture.]

ARFVEDSONITE, *Min.*, p. 243.—*Anal.*, El Paso Co., Colorado, *König*, *Am. Phil. Soc.*, *Philad.*, xvii., 516, 1877, or *Z. Kryst.*, i., 430. Greenland, discussion of composition, *Döller*, *Z. Kryst.*, iv., 34, 1879.

ARGENTITE, *Min.*, p. 38; App. II., p. 4.—*Cryst.*, description, *Groth*, *Min.-Samml.* Strassburg, 1878, p. 50.

ARGENTOPYRITE, *Min.*, p. 39; App. II., p. 4.—See *Sternbergite*, p. 115.

Argyropyrite.—See *Sternbergite*, p. 115.

ARITE.—App. II., p. 4.

Arrhenite.—*Nordenskiöld*; *Engström*, *Inaug. Diss.*, Upsala, 1877 (Abstr. by *Brögger*, *Z. Kryst.*, iii., 201, 1878).—A substance looking like red feldspar; occurs with fergusonite and cyrtolite at Ytterby, Sweden. G. = 3·68. Analysis: Ta₂O₅ 21·28, Cb₂O₅ 2·67, SiO₂ 17·65, ZrO₂ 3·42, Fe₂O₃ 1·87, Al₂O₃ 3·88, Ce₂(Di₂, La₂)O₃ 2·59, Y₂O₃ 22·06, Er₂O₃ 11·10, CaO 5·22, BeO 0·74, H₂O 6·87 = 100·35.

[Regarded as only a decomposition product, and hence not deserving of a distinct name.]

Arsenargentite.—*J. B. Hannay*, *Min. Mag.*, i., 149, 1877. In orthorhombic acicular crystals imbedded in native arsenic. Analysis gave: As 18·43, Ag 81·37 = 99·80, corresponding to the formula Ag₃As. Source "probably Freiberg."

[An imperfect description from a single specimen of uncertain origin is a most unsatisfactory basis for a new name.]

ARSENIC, *Min.*, p. 17; App. II., p. 5.—*Cryst.*, anal. (Janovsky), Joachimsthal, *v. Zepharovich*, *Ber. Ak. Wien*, lxxi., 272, 1875.

ARSENOSIDERITE.—Min., p. 76, App. II., p. 5.

ARSENOLITE, Min., p. 183.—Anomalous optical characters of artificial crystals, perhaps pseudo-isometric, *Grosse-Bohle*, Z. Kryst., v., 233, 1880. See also *Senarmontite*, p. 108.

ARSENOPYRITE, Min., p. 78; App. II., p. 5.—Cryst., Joachimsthal, *Gamper*, Verh. geol. Reichs., 1876, 354. With pyrite in parallel position, *Sadebeck*, Wied. Ann., v., 576, 1878; do. with galenite, *Groth*, Min.-Samml., Strassburg, p. 39, 1878. Reici e. stein, Silesia, *Hare*, Z. Kryst., iv., 296, 1879.

Arzruni (Z. Kryst., ii., 430, 1878) has examined (but see *Hare l. c.*) crystals from eight localities, and has shown considerable variation in angle between them. He also states that while the composition is different for different localities, it agrees neither with $\text{FeS}_2 + \text{AsS}_3$, nor with $m\text{FeS}_2 + n\text{FeAs}_2$, but that the percentage amount of iron remains nearly constant.

Becke (Min. Mitth., 1877, 101) discusses the relations in crystalline axes between arsenopyrite, danaite, and glaucodot, and concludes that they do not correspond with the amount of cobalt present, as suggested by *Scheerer*; this result, however, is questioned by *Groth* (Z. Kryst., ii., 520).

ARSENOTELLURITE.—App. II., p. 5.

ARSENSTIBITE.—App. II., p. 5.

ASMANITE, App. II., p. 5.—In meteoric iron of Rittersgrün, *Weisbach*, J. Min., 1876, 934; *Winkler*, ib., 1879, 903. According to *Weisbach*, asmanite is identical with tridymite, as suggested by *v. Lasaulx* (Z. Kryst., ii., 274, 1878). See in Nov. Act. Leopold.-Car. Ak., xl., 358, 1878. See also *Groth*, Tab. Uebers. Min., p. 33, 1882.

ASPIDOLITE.—App. I., p. 2, II., p. 5.

ASTEROITE.—App. I., p. 2.

ASTROPHYLLITE, Min., p. 308; App. II., p. 6.—With arfvedsonite and zirkon, El Paso Co., Colorado, *König*, Am. Phil. Soc., Philad., xvi., 509, 1877 (or Z. Kryst., i., 423). An analysis gave: SiO_2 34.68, TiO_2 13.58, ZrO_2 2.20, Fe_2O_3 6.56, Al_2O_3 0.70, FeO 26.10, MnO 3.48, Na_2O 2.54, K_2O 5.01, H_2O 3.54, MgO 0.30, CuO 0.42, Ta_2O_5 (?) 0.80 = 99.91.

Cryst. and optical exam., Norway and Colorado, *Bücking*, Z. Kryst., i., 433, 1877; *Brögger*, Z. Kryst., ii., 278, 1878. *Brögger* concludes that the mineral belongs to the triclinic system. It is now referred to the pyroxene group.

ATACAMITE, Min., p. 121; App. II., p. 6.—Cryst., Chili, *Brögger*, Z. Kryst., iii., 488, 1879; *v. Rath*, Z. Kryst., v., 256, 1880.

Anal., Yorke's Peninsula, Wallaroo, *T. C. Cloud*, Chem. News, xxxiv., 254, 1876. New South Wales, *Liversidge*, Proc. Roy. Soc., N. S. W., Nov. 3, 1880.

From the Nellore District, India, *Mallet*, Rec. Geol. Surv. India, xii., 171, 1879.

ATELESTITE.—Min., p. 392; App. II., p. 6.

Atelina, ATELITE.—See *Tenorite*, p. 119.

Atopite.—*Nordenskiöld*, Geol. För. Förh., iii., 376, 1877.

Isometric; in octahedrons, with cube and dodecahedron, also *m-m.* and *i-n* planes. H. = 5.5-6. G. = 5.03. Lustre greasy. Color yellow to resin brown. Translucent. Composition $\text{R}_3\text{Sb}_2\text{O}_7 = \text{Sb}_2\text{O}_3$ 73.12, CaO 17.51, FeO 2.71, MgO 1.50, K_2O 0.84, Na_2O 4.32 = 100. Analyses: 1, the mineral fused with sodium carbonate; 2, do. reduced with hydrogen; 3, mean of (1) and (2).

	Sb_2O_3	FeO	MnO	CaO	K_2O	Na_2O	
1.	72.61	3.04	1.34	18.05	0.86	4.40	
2.	.....	2.54	1.72	17.65	0.86	4.40	
3.	72.61	2.79	1.53	17.85	0.86	4.40	= 100.04.

B. B. in forceps in O. F. unchanged. On charcoal in R. F. sublimes in part, fuses at first with difficulty, and gives finally, when the antimony pentoxide is all reduced to the metallic state and driven off, a dark infusible slag. In salt of phosphorus dissolves to a clear bead, yellow while hot, and colorless on cooling. Insoluble in acids; decomposed with difficulty by fusion with sodium carbonate. Easily reduced by hydrogen. (cf. *romeite*.)

Occurs as octahedrons imbedded in hedyphane, which in turn forms little veins in rhodinite; rare. Locality Långban, in Wermland, Sweden. Named from *ἄτοπος*, *unusual*.

AUGITE.—See *Pyroxene*, p. 100.

AUTUNITE, Min., p. 586; App. II., p. 6.—Himmelfahrt mine, Johanngeorgenstadt, Saxony; *Brezina* makes the crystals to be monoclinic (or triclinic), with pseudo-tetragonal symmetry, Z. Kryst., iii., 273, 1879.

Composition, *Church*, J. Chem. Soc., Feb., 1875, 109.

AXINITE, Min., p. 297; App. II., p. 6.—Cryst., Veszverés, Hungary, and Medels, Switzerland, *Schmidt*, J. Min., 1881, i., 371 ref. (or Z. Kryst., vi., 98).

Pyro-electrical characters, *Hankel*, Wied. Ann., vi., 57, 1879. Expansion of crystals with heat, *Beckenkamp*, Z. Kryst., v., 451, 1881.

AZORITE.—Min., p. 761; App. II., p. 6.

AZURITE, Min., p. 715; App. II., p. 6.—Cryst. descript. (twins), Chessy near Lyons, *Groth*, Min.-Samml., Strassburg, p. 138, 1878.

BABINGTONITE, Min., p. 227; App. II., p. 6.—Observed in slag from Bessemer steel, *Klemm*, Chem. Centralbl., 1874, 215. See also *Szaboite*, p. 118.

Balvraidite.—*Hedde*, Min. Mag., iv., 117, 1880.

Structure saccharoidal. H. = 6. G. = 2.905–2.908. Color pale purplish brown. Analyses (1) dark var.; (2) paler var.:

SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O	
46.04	20.11	2.52	0.79	8.30	13.47	2.72	1.36	4.71	= 100.02.
46.17	20.95	1.86	0.84	7.36	13.25	3.25	1.56	4.90	= 100.14.

B. B. fuses with intumescence to a vesicular pale blue glass. Presents a mottled appearance under the microscope, and was judged to be homogeneous. Occurs in a granular limestone, at Balvraid, Inverness-shire, Scotland. [Needs further examination; as the description stands at present, this substance, "which may prove to be a new mineral," certainly does not deserve a distinct name.]

Barcenite.—*J. W. Mallet*, Am. J. Sc., xvi., 306, 1878.

Massive; structure finely granular, compact or porous; also columnar (pseudomorphous after livingstonite). H. = 5.5. G. = 5.343. Lustre dull, earthy, sometimes slightly resinous. Color, dark gray, nearly black. Streak ash gray, with slight greenish tint. Fracture tolerably even. Brittle. Analysis by J. R. Santos:

Sb*	S	Hg	Ca	O	H ₂ O	
50.11	2.82	20.75	3.88	[17.61]	4.73 (below 130°C. 1.23)	SiO ₂ 0.10 = 100.

* Atomic weight = 120.

The sulphur is assumed to exist as HgS, and is accordingly deducted with a corresponding amount of mercury. For the remainder the following atomic ratios are then obtained:—RO : Sb₂O₃ : Sb₂O₅ = 4 : 1 : 5, and Sb₂O₅ : H₂O = 1 : 5. The antimonic acid (Sb₂O₅, 5 H₂O) is again assumed to exist independently as an impurity, and the formula for the remainder written: [Sb₂O₃ 4 (RO)] (Sb₂O₅), corresponding to a normal antimonate MSbO₃.

B. B. in O. F. decrepitates slightly, turns nearly white, and becomes rounded on the edges; in R. F. gives off antimony fumes, accompanied with a greenish blue flame. In

the closed tube gives off water, metallic mercury, black mercury sulphide, and a little antimony trioxide; in the open tube metallic mercury is deposited, and also more antimony trioxide, the fumes of sulphur dioxide passing off. On charcoal a white antimonial sublimate, and with soda antimony is obtained in metallic beads. With borax in O. F. a clear colorless glass, which in R.F. becomes turbid.

From Huitzuc, State of Guerrero, Mexico. Associated with livingstonite, from the decomposition of which it has been formed. Named after Sr. Mariano Barcena, the Mexican mineralogist. [That the original material examined is, as assumed, a mixture, cannot be questioned, but that the true nature of the compounds present has been, or in fact can be, definitely settled so as to establish beyond doubt the nature of a new species seems very improbable.]

BARETTITE.—App. I., p. 3.

BARITE, Min., p. 616; App. II., p. 6.—**Cryst.**, *v. Kokscharof*, Min. Russl., vii., 25, 1875. Calafuria, near Leghorn, Italy, *Uzielli*, Acc. Linc. Mem., II., iii., 611, 1876. Valle della Sterza, Tuscany, *D'Achiardi*, Acc. Soc. Tosc., iii., 160, 1877. *Groth*, Min.-Samml. Strassburg, p. 142, 1878. Muzsaj, Hungary (wolyn), *Schmidt*, Z. Kryst., iii., 428, 1879. Swoszowice, Galicia, *Vrba*, Z. Kryst., v., 433, 1881.

Effect of change of temperature on indices of refraction, *Arzruni*, Z. Kryst., i., 71, 1877.

Anal., earthy barite, St. Louis, Mo., *König*, Proc. Acad. Nat. Sc. Philad., 1876, 156. Last Chance Mine, Morgan Co., Mo., *Broadhead*, Am. J. Sc., III., xiii., 419, 1877.

BARSWITE, Min., p. 340.—Re-examined microscopically by *Bauer* and analyzed by *Friederici*, and shown to have the composition of anorthite, with which it does not, however, in all respects correspond; G. = 2.584 after deduction for the corundum present, J. Min., 1880, ii., 63.

BARTHOLOMITE.—App. II., p. 6.

Barylite.—*C. W. Blomstrand*, Geol. Förr. Förrh., iii., 128, 1876.

In groups of prismatic crystals, more or less tabular in habit. Two distinct cleavages forming an angle of about 84°. H. = 7. G. = 4.03. Lustre greasy. Colorless. Semi-transparent. Analysis:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	BaO	PbO	CaO	MgO	CuO	Bi ₂ O ₃	ign
($\frac{1}{2}$)	34.36	16.02	0.98	46.23	0.93	0.68	0.27	0.09	0.19	0.15 = 99.90.

Formula calculated: Ba₂[Al₂Si₂O₂₄], which requires: SiO₂ 33.94, Al₂O₃ 16.61, BaO 49.45 = 100. B. B. infusible; not attacked by acid. Named from *βαρύς* heavy, and *λίθος* stone. Occurs with hedyphane in crystalline limestone at Långban, in Wermland, Sweden. [A mineral of so unusual composition deserves to be more thoroughly described on the crystallographical side.]

BARYTOCALCITE, Min., p. 761.—**Anal.** (by *Lundström*), corresponding to CaCO₃ + BaCO₃, Långban, Sweden, *Sjögren*, Geol. Förr. Förrh., iii., 289, 1876. According to *Des Cloizeaux* (Bull. Soc. Min., iv., 95, 1881), the mineral analyzed by *Lundström* is rhombohedral with a cleavage angle of about 105°.

BARYTOCELESTITE.—See *Celestite*, p. 21, and App. II., p. 7.

Baryturanite = *Uranocircite*, p. 127.

BASTITE, Min., 469.—**Anal.**, Elba, *Pisani*, C. R., lxxxiii., July 10, 1876.

BASTNÄSITE.—See *Tysonite*, p. 126, and App. I., p. 2.

BEAUXITE, Min., p. 174; App. II., p. 7.—**Analyses**, Feistritz and Nassau, showing wide variation in composition, *Henatsch*, Inaug. Diss., Breslau, 1879 (Z. Kryst., iv., 642, 1880). Age, origin, etc., *Dieulaufai*, C. R., xciii., 804, 1881.

Beccarite.—See *Zirkon*, p. 134.

Beegerite.—*König*, Am. Chem. Journ., ii., 379, 1881 (or *Z. Kryst.*, v., 322).

Isometric, in elongated crystals; also massive. Cleavage cubic. $G = 7.273$. Color light to dark gray. Lustre brilliant metallic. Mean of 4 partial analyses, after deduction of quartz (2.6 p. c.):

S	Bi	Pb	Cu
14.97	20.59	64.23	1.70 = 10.49.

This corresponds nearly to $Pb_2Bi_2S_3$ or $6PbS + Bi_2S_3 = S\ 14.78, Bi\ 21.36, Pb\ 63.84$. B. B. decrepitates, giving on charcoal reactions for lead and bismuth. Dissolves readily in warm HCl. From the Baltic Lode, near Grant P. O., Park Co., Colorado. Named after Mr. Hermann Beeger, of Denver.

BERAUNITE—ELEONORITE, *Nies*, xix. Ber. Oberhess. Ges. Nat.-u. Heilk., p. 111, 1880. *Streng*, J. Min., 1881, i., 102.

Monoclinic crystals, tabular (*i-i*) and prismatic (in direction of *b*), in habit similar to some crystals of lazulite from Georgia. Axes $b : a : c = 4.0157 : 1 : 2.755, \beta = 48^\circ 33'$. $O \wedge i-i = 131^\circ 27'$, $i-i \wedge 1 = 104^\circ 24'$; $1 \wedge 1$ (clinodiag.) = $39^\circ 56'$. Twins with *i-i* as twinning plane, also penetration twins. Cleavage *i-i*. Often in druses, and in radiated foliated crusts (*Streng*). H. = 3-4. Lustre vitreous, on *i-i* inclining to pearly. Color red brown to dark hyacinth red. Streak yellow, strongly dichroic.

Analyses by *Streng*: 1, crystals; 2, radiated coating on limonite:

	P ₂ O ₅	Fe ₂ O ₃	H ₂ O
1.	31.88	51.94	16.37 = 100.19.
2.	31.78	52.05	16.56 = 100.39.

Formula $[Fe_2]_3P_4O_{10}, 8H_2O$, or $2[Fe_2]P_2O_8 + [Fe_2]H_6O_6 + 5aq$. B. B. fuses easily to a black bead metallic in appearance, crystalline on cooling. Easily soluble in HCl. Occurs on limonite at the Eleonore mine on the Dünsberg, near Giessen, and at the Rothläufchen mine near Waldgirmes, in the same region.

Streng (l. c.) calls attention to the close relation of eleonorite to beraunite from St. Benigna, Bohemia (*Min.*, p. 558). The following are analyses of the original beraunite: 1. *Tschermak*, Ber. Ak. Wien, xlix., 341, 1864; 2, 3. *Boricky*, ib., lvi., 11, 1867; 4. *Frenzel*, from Scheibenberg, Saxony, J. Min., 1873, 23.

	P ₂ O ₅	Fe ₂ O ₃	H ₂ O
1. St. Benigna.....	30.5	55.0	14.0 Na ₂ O 1.5 = 101.
2. " ".....	30.2	55.8	15.1 = 101.
3. " ".....	28.99	55.98	14.41 = 99.38.
4. Scheibenberg.....	28.65	54.50	16.55 = 99.70.

Streng shows that in composition the St. Benigna mineral is nearly identical with eleonorite, but regards the differences in physical characters too great to allow of their being united. The mineral of *Frenzel* seems to have a different crystalline form.

Bertrand (*Bull. Soc. Min.*, iv., 88, 1881), has subjected both the beraunite and eleonorite to a new examination, and concludes that in angles, dichroism and optical qualities they are the same. There would seem consequently to be little doubt of their identity.

Bergamaskite.—See *Amphibole*, p. 5.

Bernardinite.—Described as a new fossil resin from San Bernardino, Cal., by *J. M. Stillman* (*Am. J. Sc.*, III., xviii., 57, 1879); since shown by him to be an exudation from a species of conifer, which has received its particular characters from exposure to the atmosphere (ib., xx., 93, 1880).

BERYL, *Min.*, p. 245; App. II., p. 7.—**Cryst.**, Eidsvold, Norway, *Websky*, *Min. Mitth.*, 1876, 117. Alexander Co., N. C., *Hidden*, *Am. J. Sc.*, III., xxi., 159; xxii., 24, 1881.

Santa Fé, Bogota, New Granada, *Vrba*, Z. Kryst., v., 430, 1881. Gold sands of the Ural, *N. v. Kokscharof, Jr.*, Bull. Ac. St. Pet., xxvii., 35, 1881 (or Min. Russl., viii., 223).

Pyro-electrical properties, *Hankel*, Pogg. Ann., clviii., 161, 1876. Specific gravity of different specimens, *Church*, Geol. Mag., II., ii., 320, 1875.

Occurrence of emeralds of unusual size (one crystal 10 inches long) and beauty of color, in *Alexander Co.*, N. C., *Hidden*, Am. J. Sc., xxii., 489, 1881.

Mallard (Ann. Min., VII., x., 148, 1876) describes the optical anomalies observed in crystals of beryl, and concludes that it is *pseudo-hexagonal*, the individuals of which a crystal is made up being orthorhombic; the relations are regarded as similar to those in apatite. See also *Des Cloizeaux*, Bull. Soc. Min., iv., 94, 1881.

Atterberg (Geol. För. Förh., ii., 405, 1874) uses the name PSEUDO-EMERALD (pseudo-smaragd) to designate a mineral resulting from the alteration of beryl. The name was introduced by *Berzelius* for pseudomorphous crystals, consisting, as he regarded it, of ordinary beryl and mica. *Atterberg* retains the name for the hard portion of similar pseudomorphs, which, however, he finds to be not true beryl. Its characters are: hardness 5.5; G. = 2.70; lustre waxy; color dark grayish green; fracture splintery. Intimately mixed with mica scales. Analyses: 1, 2, the latter on material not entirely free from mica:

	SiO ₂	Al ₂ O ₃	BeO	FeO	MgO	K ₂ O	H ₂ O	
1.	57.32	17.46	13.11	0.30	0.32	7.82	3.64	= 99.97.
2.	56.23	19.05	12.55	0.18	0.50	7.45	4.83	= 100.79.

If the water is considered basic, the ratio for bases to silica is 2 : 3. The mineral differs from ordinary beryl in having lost part of its silica and gained potash and water; the alumina and glucina are sensibly unchanged. Prom Kårarfvet, near Fahlun, Sweden.

Grattarola (Riv. Scientif.-industr., No. 19, 1880, Florence) has given the name ROSTERITE to a mineral which he regards as a distinct variety of beryl. It occurs in short prismatic to tabular doubly-terminated crystals. Basal plane rounded, and apparently formed of many planes of varying position, belonging to the second series. In polarized light a basal section is divided into six sectors, corresponding to the prismatic edges, for the three alternate of which the extinction is the same. Biaxial interference figures (angle 15°) observed, the extinction plane in part parallel to the prism, in part inclined from 31° to 7°. Color pale rose red. Analyses: 1, 2, from the respective ends of a crystal, which had a nucleus of normal beryl (anal. 3); 4, "typical rosterite."

	SiO ₂	Al ₂ O ₃	BeO	MgO	CaO	Na ₂ O, K ₂ O	Li ₂ O	H ₂ O
1. G. = 2.77	61.97	21.93	8.62	1.26	0.42	undet.	....	undet.
2. G. = 2.74	69.26	21.18	9.71	1.57	2.55	undet. 0.58	tr.	3.07 = 98.92.
3. G. = 2.77	62.88	17.09(?)	15.97(?)	2.62	2.99	undet.	....	2.32 = 103.87.
4. G. = 2.75	61.34	23.20	8.81	0.50	2.19	1.00	....	2.03 = 99.07.

[The reasons for regarding this as a distinct variety of beryl are: its crystalline habit, its optical character, and the variation in chemical composition. To the first, however, no weight can be given, and as little to the second, since analogous optical anomalies have been previously observed in ordinary beryl; as to the composition, further careful analyses are needed to establish that point.] Locality, Island of Elba.

BERZELITE, Min., p. 544.—*W. Lindgren* (Geol. För. Förh., v., 552, 1881) states that the hitherto accepted description of berzelite is incorrect, in consequence of its having been confounded with another mineral which occurs at Långban, associated with it. The characters of true berzelite are:

Massive; isometric (*Sjögren*, Geol. För. Förh., ii., 533, 1875, and *A. Wichmann*, Z. Kryst., v., 105, 1880); no distinct cleavage. H. = 5. G. = 4.07-4.09. Lustre resinous. Color honey yellow to sulphur yellow. Transparent to translucent. Fracture semi-conchoidal. Brittle. *B. B. fuses rather easily to a brown bead. Soluble in hydrochloric and nitric acids. Occurs imbedded in small grains in a granular calcite; with calcite in hausmannite and in braunite; with caryinite. Sometimes of a green color, from minute inclosed hausmannite crystals.

There also occurs at Långban another arsenate, having the following characters: Mass-

ive ; anisotrope, but crystalline system uncertain ; no distinct cleavage. $H. = 5$. $G. = 4.03-4.04 ; 3.89$. Color dirty yellowish white or light sulphur yellow. An analysis by L. W. McCay gave : As_2O_3 62.00, CaO 20.00, MgO 12.81, MnO 4.18, PbO , FeO tr., insol. (SiO_2) 0.68 = 99.67 ; this corresponds to a simple ortho-arsenate, $R_3As_2O_8$. Occurs massive in a light brown fine granular mixture of calcite and manganiferous mica, often penetrated by hausmannite. This mineral is regarded as the one to which the earlier descriptions belong (Min., p. 544), but while optically distinct from berzeliite, their true relation is still very uncertain.

[The above observations only increase the doubts as to the true nature of berzeliite ; as possibly bearing upon the question as to the relation of the isotrope and anisotrope minerals mentioned, attention may be called to the fact that Des Cloizeaux has observed isotropic varieties of gadolinite and also of homilite, supposed to be due to alteration.]

See also *Caryinite*, p. 20.

BEUDANTITE, Min., p. 589.—Optical exam., the same characters belong to the beudantite of Horhausen, of Cork (Adam's corkite), and of Dernbach (Adam's dernbachite) ; *Bertrand*, Bull. Soc. Min., iv., 255, 1881.

BEYRICHITE.—App. I., p. 3.

Bhreckite (or **Vreckite**), *Heddle*, Min. Mag., iii., 57, 1879. Fine granular, scaly ; soft and friable. Occurs as a light apple-green coating on quartz crystals. An analysis gave : SiO_2 34.92, Al_2O_3 7.16, Fe_2O_3 12.71, FeO 2.11, MnO 0.41, CaO 16.08, MgO 8.26, H_2O 17.77 (1.03 at 100° C.) = 99.42 (alkalies in traces). Soluble in HCl. From a cavity in a boulder of syenitic granite, found on the hill of Ben Bhreck, near Tongue, in Sutherland, Scotland. [Provisionally named on the ground that "the substance may prove to be a new mineral"—needs further examination. No sufficient proof of the homogeneity of the material analyzed is given.]

BIEIROSITE.—App. II., p. 7.

BINDHELMITE, Min., p. 591.—*Anal.*, Sevier Co., Ark., *Dunnington*, Amer. Assoc., 1877, 182 ; *C. E. Wait*, Trans. Am. Inst. Min. Eng., viii., 50, 1880.

BINNITE, Min., p. 90 ; App. II., p. 7.—*Cryst.*, Binnenthal, *Hessenberg*, Min. Not., xii., 6, 1875 ; *W. J. Lewis*, Z. Kryst., ii., 192, 1878.

BIOTITE.—See *Mica Group*, p. 77.

Bischofite.—See *Chloromagnesite*, p. 25.

BISMITE, Min., p. 785 ; App. II., p. 7.

BISMUTH, Min., p. 19 ; App. II., p. 7.—*Cryst.*, Schneeberg, *Fletcher*, Phil. Mag., V., ix., 185, 1880.

Anal. (with galenite), Mossgrufva, Nordmark, *Sjögren*, Geol. För. Förh., iv., 106, 1878.

BISMUTHINITE, Min., p. 30 ; App. II., p. 7.—*Cryst.*, Tazna, Bolivia, *Groth*, Z. Kryst., v., 252, 1880.

Anal., Choroloque, Bolivia, *Domeyko*, 6th App. Min. Chili, p. 22, 1878.

BISMUTITE, Min., p. 716 ; App. II., p. 7.—*Weisbach* (Jahrb. Berg.-Hutt., 1877) has described a supposed new bismuth carbonate under the name of **BISMUTOSPHERITE**.—Occurs in spherical forms with concentric structure, fine fibrous, radiated. $H. = 3$. $G. = 7.28-7.32$. Color bright yellow to blackish brown, different in successive layers. Streak yellowish gray. An analysis gave *Winkler* : CO_2 8.97, Bi_2O_3 88.58, quartz 0.98 = 97.83. Formula calculated $Bi_2CO_3 (= Bi_2C_2O_5 + 2Bi_2O_3)$, which requires CO_2 8.66, Bi_2O_3 91.34 = 100 [but uncertain, as the analysis shows a considerable loss] ; found at Neustädte, near Schneeberg, Saxony. *Weisbach* states that this mineral is the original *Arsenik-wismuth* of

Breithaupt; Frenzel previously described what he regarded as Breithaupt's mineral under the name of *agricolite* (App. II., p. 1).

Other analyses of bismuth carbonates have been made by Carnot (C. R., lxxix., 304, 1874) of the mineral from Meymac, Corrèze, he found Bi_2O_3 86-90 p. c., CO_2 3.14-6.43, H_2O 1.94-4.86. He distinguishes three types: 1 (anal. 1), grayish white, somewhat foliated; 2 (anal. 2), dark gray, slightly greenish, fibrous; 3 (anal. 3), white, earthy, with yellowish spots. Anal. 4 by Frenzel (J. Min., 1873, 801, 946), from San Luis Potosi, Mexico (see also Barcena, Rev. Cientif. Mex., i., 8, Dec., 1879). Anal. 5 by Liversidge, with stream tin from Pond's Creek, New South Wales (Proc. Roy. Soc. N. S. W., Nov. 3, 1880). Anal. 6 by Winkler, quoted by Weisbach (J. Min., 1880, ii., 112), from Neustädte, G. = 6.12-6.27, pseudomorph after native bismuth.

		CO_2	Bi_2O_3	H_2O	PbO	FeO	CaO	MgO	As_2O_3	Sb_2O_3	SO_3	HCl	gangue
1. Meymac,	G. = 6.94	3.74	89.75	2.76	0.55	0.53	0.35	tr.	0.73	0.57	0.25	0.37	0.20 = 99.80.
2. "	G. = 7.26	4.15	87.50	3.55	0.44	0.50	0.55	0.07	0.80	1.25	0.22	0.20	0.30 = 99.53.
3. "	G. = 7.08	5.25	86.90	3.02	0.40	0.43	0.38	0.05	0.65	1.20	0.13	0.14	1.10 = 99.75.
4. San Luis,	G. = 7.59	7.00	90.10	1.80,	SO_3	0.27,	gangue	0.30 = 99.47.					
5. Pond's Creek		5.43	76.06	[1.84],	SiO_2	4.69,	Al_2O_3	(Fe_2O_3 tr.)	1.98 = 100.				
6. Neustädte,	G. = 6.20	2.91	95.90	1.04 = 99.65.									

[These analyses show a wide variation, due chiefly, without doubt, to the impurity of the material analyzed. Frenzel's mineral is rather near the bismutospherite of Weisbach, which last seems to be distinct from the other minerals; if the loss (see anal.) is not water, it is an anhydrous carbonate.]

The bismuth carbonate described by Vogl as occurring at Joachimsthal (Min., p. 717, 753 A), since called *WALTHERITE*, includes, according to Bertrand (Bull. Soc. Min., iv., 58, 1881) two species, the one brown, the other green, optically unlike.

BISMUTOFERRITE.—App. I., p. 3; II., p. 7.

Bjelkite.—See *Cosalite*, p. 31.

Blackmorite.—See *Opal*, p. 86.

BLÉNDE.—See *Sphalerite*, p. 111.

BLÖDITE, Min., p. 643; App. II., p. 8.—**Cryst.**, Pendschab, India, *Schimper*, Z. Kryst., i., 71, 1877.

Occurrence at Ischl, Min. Mitth., 1877, 97.

Blomstrandite. *Lindström*, Geol. För. Förh., ii., 162, 1874.

Massive. H. = 5.5. G. = 4.17-4.25. Lustre vitreous. Color black. Powder coffee brown. Opaque, only translucent in very thin splinters.

Analyses:

	Cb_2O_3	Ta_2O_5	TiO_2	UO	FeO	CaO	H_2O	
1.	49.76	10.71		23.68	3.33	3.45	7.96,	MgO 0.16, Al_2O_3 0.11, MnO 0.04, precip. by H_2S 0.12 = 99.32.
2.	60.77			23.37	3.39	3.04	8.17,*	MgO tr. MnO 0.06, precip. by H_2S 0.20 = 99.

* At 100° 2.78 (in another trial 2.65), above 100° 5.39.

The atomic ratio of R : Cb, Ti = 1:2.5, and for Ti : Cb = 1:2.75. B. B. fuses with difficulty. Gives off water in the closed tube. With borax in O. F. a reddish yellow, on cooling a yellow bead; in R. F. reddish brown. With salt of phosphorus in O. F. a red brown bead when hot, and yellow when cold; in R. F. reddish yellow hot, and green cold.

Found very sparingly with *nohlite* (App. II., p. 41) in a feldspar quarry, at Nohl, Sweden. Named for Prof. C. W. Blomstrand of Lund. [Apparently distinct from other known minerals of this group, but needs further examination.]

Bolivite. *Domeyko*, 6th App. Min. Chili, p. 19, 1878. Described in some detail as a bismuth oxysulphide, Bi_2O_3 with Bi_2S_3 . It is derived from the oxidation of the sulphide bismuthinite, and is of very uncertain composition. The description would apply to a mix-

ture of the oxide with the original sulphide, which is enclosed in it, and it is very improbable that they are in chemical combination. The uncertain character of the mineral seems to have been later accepted by Domeyko, for in the 3d Ed. of his Mineralogy (1879, p. 304) the occurrence is only mentioned briefly, and without any name. Locality, mines of Tazna, in the province of Choroloque, Bolivia.

BOMBICITE.—App. II., p. 8.

BORACITE, Min., p. 595; App. II., p. 8.—The question as to the true explanation of the long recognized “optical anomalies” of boracite has been recently discussed by *Mallard*, *Ann. Min.*, VII., x., 93, 1876; and *Bull. Soc. Min.*, ii., 147; *E. Geinitz*, *J. Min.*, 1876, 484; 1877, 394; *Baumhauer*, *Z. Kryst.*, iii., 337, 1879; *Klein*, *J. Min.*, 1880, ii., 209; 1881, i., 239.

Geinitz shows that (contrary to the earlier explanation) unaltered boracite is anisotropic; *Mallard* makes the species pseudo-isometric, explaining the optical phenomena by the grouping of twelve orthorhombic individuals (as remarked by *Klein* in his hypothesis was proposed by *Hartmann* in 1826). *Baumhauer* reaches a conclusion somewhat similar to that of *Mallard* on the basis of the results of etching experiments. *Klein*, however, seems to settle the question conclusively in favor of the true isometric character of the species. He shows, for example, that the interior optical structure does not correspond to the exterior planes; that the distribution of the etching figures does not depend on the interior optical limits; and further, that upon an increase of temperature the former optical limits disappear or become indistinct, and that the optical fields change their position without affecting the form of the etching figures. He concludes that all the optical anomalies can be explained by the internal tension produced in the course of the growth of the crystal.

BORAX.—Min., p. 597; App. II., p. 8.

BORDOSITE.—See *Amalgam*, p. 4; also App. II., p. 8.

BORNITE, Min., p. 94; App. II., p. 8.—Analyses from Swedish localities quoted by *Cleve*, *Geol. För. Förh.*, ii., 526, 1875. Relation to magnetite discussed, *Nordenström*, *ib.*, iv., 341, 1878.

BOULANGERITE.—Min., p. 99; App. II., p. 8.

BOURNONITE, Min., p. 96; App. II., p. 8.—**Cryst.** *Przibram* and *Waldenstein*, *v. Zepharovich*, *Lotos*, 1876 (*J. Min.*, 1876, 555, 556). *Nagyag*, *com Rath*, *Z. Kryst.*, i., 602, 1877. *Horhausen*, etc., *Groth*, *Min.-Samml. Strassburg*, p. 61, 1878. *Neudorf*, *Harz*, *v. Kokscharof*, *Min. Russl.*, viii., 123, 1881.

Anal. *Przibram*, *Helmhaecker*, *Min. Mitth.*, 1875, 86.

BOUSSINGAULTITE, Min., p. 635; App. II., p. 8.—A related salt analyzed by *Goldsmith*, *Proc. Ac. Nat. Sc. Philad.*, 1876, 264.

BOWENITE, Min., p. 465.—From New Zealand, *Berwerth*, *Ber. Ak. Wien*, lxxx., 116, 1879.

Bowlingite. *J. B. Hannay*, *Min. Mag.*, i., 154, 1877.

Massive, consisting of minute crystals. Soft, feel like steatite. G. = 2.282–2.290. Color deep green. In thin sections semi-transparent. Analyses: 1, 2, 3, 4, *Hannay*; 5, *Young*, *Trans. Geol. Soc. Glasgow*, ii., 212:

		SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaCO ₃	H ₂ O	
1.	Bowling	G. = 2.282	34.32	18.07	3.65	6.81	9.57	5.14	22.70 = 100.26.
2.	“		35.08	16.85	3.92	6.95	10.22	4.89	21.85 = 99.76.
3.	Cuthbin	G. = 2.29	35.66	15.09	5.22	7.02	12.41	5.02	19.89 = 100.31.
4.	“		35.82	16.14	4.85	6.99	11.73	4.87	19.63 = 100.03.
5.	Cathcart		31.95	15.40	....	21.40	20.95	4.30	[6.30] = 100.00.

Analysis 5, by *Young*, is said to have been made on the same material as that examined by *Hannay*! Found at *Bowling*, near *Dumbarton*, on the *Clyde*, and from the *Cuthbin hills*,

Scotland, where it forms little veins in dolerite, being intimately associated with chrysolite, from which it may have been formed. Heddle (Trans. Soc. Edinb., xxix., 97, 1879), gives two analyses of the original mineral, of which the following is one: SiO_2 38.08, Al_2O_3 6.26, Fe_2O_3 4.36, FeO 4.97, MnO 0.23, CaO 2.97, MgO 21.46, K_2O 0.95, Na_2O 0.11, H_2O 20.48 = 99.97 (H_2O at 100° , 12.31). He concludes that Hannay's analyses were erroneous, and that the mineral is really a saponite. [The describer suggests a doubt as to the purity of the original material, which is a suggestion the accuracy of which no one will question.]

Brackebuschite.—See *Des Cloizite*, p. 36.

BRAUNITE, Min., p. 163.—**Anal.**, Nagpur, India, *F. R. Mallet*, Rec. Geol. Surv. India, xii., 73, 1879. See also *Pyrolusite*, p. 99.

Bravaisite. *E. Mallard*, Bull. Soc. Min., i., 5, 1878.

Orthorhombic (on optical grounds); in thin layers and schistose masses consisting of fine crystalline fibres, mostly parallel in position. $H. = 1-2$. $G. = 2.6$. Color gray to greenish gray. Double refraction negative, strong; $2E_a = 40^\circ$. Unctuous to the touch. Pastelike when wet. Analysis:

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	H_2O
51.4	18.9	4.0	2.0	3.3	6.5	13.3 = 99.4.

The formula deduced, after the deduction of the iron as due to the presence of pyrites, is $\text{R}_2[\text{Al}_2]_2\text{Si}_5\text{O}_{26} + 8 \text{ aq.}$ B. B. fuses easily to a white glass. In the closed tube gives off water and becomes brown. Partially attacked by acids. Found in layers in the coal and bituminous schists of Noyant (Allier Dept.), France. Named after the French crystallographer M. Bravais. [Near some varieties of glauconite.]

BREISLAKITE, Min., p. 216. According to *v. Lasaulx* (J. Min., 1878, 380), to be referred to amphibole instead of to pyroxene.

BREUNERITE, Min., p. 636.—**Cryst.**, *v. Kokscharof*, Min. Russl., vii., 181, 221, 1878.

BROCHANTITE, Min., p. 664; App. II., p. 9.—Optical properties determined (orthorhombic?), *Bertrand*, Bull. Soc. Min., iii., 56, 1830.

From Pisco, Peru, anal. by Mannington, *Semmons*, Min. Mag., iv., 259, 1881.

Made artificially, *Meunier*, C. R., lxxxvi., 686, 1878.

BRONZITE, Min., p. 208; App. II., p. 9.—**Anal.**, Dun Mt., New Zealand, *Hilger*, J. Min., 1879, 129.

BROOKITE, Min., p. 164; App. II., p. 9.—*Mallard* (Ann. Min., VII., x., 134, 1876), regards the three forms of titanium dioxide—brookite, octahedrite, and rutile—as having the same primitive form (monoclinic), and argues that the differences between the species, in the forms of the crystals and in physical characters, are due to the different ways in which the individuals are grouped together. *Schrauf* (Ber. Ak. Wien, lxxiv., 535, 1876), after an extended study of crystals from different localities, concludes that they are all monoclinic and isomorphous with wolframite; he, however, distinguishes among them three types varying in the crystallographic constants (this result was announced earlier, see App. II., p. 9; also J. Min., 1877, 800; 1878, 50). Later (*Z. Kryst.*, i., 274, 1877) he discusses the optical characters of the species in their relation to the crystalline system. The conclusions of *Schrauf* are questioned by *Groth* (Min.-Samml. Strassburg, 109, 1878), and measurements by *Bücking* are quoted agreeing with the orthorhombic form. Vom Rath earlier (*Pogg. Ann.*, clviii., 465, 1876) found crystals from Atliansk to be orthorhombic.

See also *Pseudobrookite*, p. 97.

BRUCITE, Min., p. 175; App. II., p. 9.—Pyro-electrical properties, *Hanke*, Wied. Ann., vi., 53, 1879. Calculation of the indices of refraction by a method based upon the measured diameters of the rings observed in the axial interference figures in a plate of known thickness, *Bauer*, Ber. Ak. Berlin, 1881, 958.

An anal. of a partially decomposed brucite from Siebenlehn, near Freiberg, gave Petersen: MgO 38.92, FeO 18.73, CO₂ 7.38, H₂O 30.46, SiO₂ 4.15, Al₂O₃, CaO tr. = 99.64. After deducting the SiO₂ as quartz, and 24.49 p. c. hydromagnesite believed to be present as a decomposition product, and after calculating the remainder to 100, the result is MgO 39.89, FeO 24.92, H₂O 35.19 = 100. This is called EISENBRUCIT. *Sandberger*, J. Min., 1880, ii., 288.

BUNSENIN.—See *Krennerite*, p. 66.

BUSTAMENTITE.—App. II., p. 9.

BYERITE.—App. II., p. 9.

BYTOWNITE.—App. II., p. 9.

CABRERITE, Min., p. 561; App. II., p. 9.—From zinc mines, Laurium, Greece, opt. exam. by *Des Cloizeaux*, showing isomorphism with erythrite; anal. by *Damour*, corresponding to the formula R₄As₂O₈ + 8 aq.: As₂O₃ 41.40, NiO 28.72, CoO tr., FeO 2.01, MgO 4.64, H₂O 23.11 = 99.88 (Bull. Soc. Min., i., 75, 1878).

CACHEUTAITE.—App. II., p. 9.

CACHEUTITE. *Domeyko*, Min. Chili, 3d ed., p. 402, 1879. See App. II., p. 9, and Syst. Min., p. 798.

CACHOLONG, Min., p. 199; App. II., p. 9.—*Nordenskiöld*, Öfv. Ak. Stockholm, xxxi., May 13, 1874.

CACOXENITE, Min., p. 584; App. II., p. 9.—Anal. by Nies of a related mineral from the Eleonore mine, near Giessen, *Streng*, J. Min., 1881, i., 108.

CALAMINE, Min., p. 407; App. II. p. 9.—Cryst., Altenberg, *Seligmann*, Z. Kryst., i., 342, 1877.

According to *Fock* (Groth, Tabell. Uebers. Min., 1882, p. 84), unchanged at 340° C., and loses water only at a red heat.

CALAUERITE, Min., p. 795; App. II., p. 9.—Anal., Keystone and Mountain-Lion mines, Colorado, *Genth*, Am. Phil. Soc., Philad., xvii., 117, 1877 (or Z. Kryst., ii., 6): Te 57.32, Au 33.75, Ag 3.03, V₂O₅ 0.05, FeO 0.30, Al₂O₃, MgO, etc., 0.55 = 100 (4.96 p. c. quartz deducted). Formula (Au, Ag) Te₂, with Au : Ag = 7 : 1, this requires Te 57.93, Au 39.01, Ag 3.06. Occurs in small imperfect crystals, imbedded in quartz. H. = 2.5. G. = 9.043.

See also *Krennerite*, p. 66.

CALCITE, Min., p. 670; App. II., p. 9.—Cryst., *Hessenberg*, Min. Not., xii., 13 et seq., 1875. v. *Kokscharof*, Min. Russl., vii., 59, 1875. Brigels, Tavetsch, *Kloos*, J. Min., 1816, 413. Yellowstone Park, coated with quartz crystals in parallel position, *E. S. Dana*, Am. J. Sc., III, xii., 448, 1876, or Z. Kryst., i., 39. Ahrenthal, Tyrol, *vom Rath*, Pogg. Ann., civ., 48, 1875; Elba, etc., Pogg. Ann., clviii., 414, 1876; Bergen Hill, N. J., *id.*, Z. Kryst., i., 604, 1877; Brazil, twins (pseudomorph), *id.*, Z. Kryst., ii., 187, 1878. *Groth*, Min.-Samml. Strassburg, p. 119, 1878. Reichenstein, Silesia, *Hare*, Z. Kryst., iv., 299, 1879. Bleiberg, v. *Zepharovich*, Lotos, 1878. Lancashire, *vom Rath*, Ber. nied. Ges. Bonn, Jan. 3, 1881.

Monograph with list of observed and of new planes on crystals from many localities, *Irby*, Inaug. Diss., Bonn, 1878 (Abstr. in Z. Kryst., iii., 612, 1879).

Twinning (— $\frac{1}{2}$ R) produced artificially, *Baumhauer*, Z. Kryst., iii., 588, 1879; *Brezina*, *ib.*, iv., 518, 1880.

Thermo-electric properties investigated, *Hankel*, Pogg. Ann., clvii., 156, 1876. On the relation between the different crystalline forms, *Scharff*, Abhandl. Senck. Ges., x., 1876; Jahresb. Senck. Ges., 1879–80, p. 113.

Långban, Sweden, anal., CaCO₃ 87.14, MnCO₃ 10.06, BaCO₃ 2.04 = 99.24, *Sjögren*,

Geol., För. Förh., iv., 111, 1878. Lindgren found 1.09 p. c. $ZnCO_3$ in calcite from Långban, ib., v., 557, 1881. Anal. of so-called onyx from Tecali, Mexico, *Damour*, C. R., lxxxii., 1085, 1876; *Barcelona*, Proc. Am. Nat. Sc. Phil., 1876, 166. Analyses of calcite and other rhombohedral carbonates, *Heddle*, Trans. Acad. Ed., xxvii., 493, 1876.

"Isomorphism" with soda nitre and relation to the other rhombohedral carbonates discussed, *Tschermak*, Min. Petr. Mitth., iv., 99, 1881.

See also *Thinolite*, p. 51.

Calcozincite. *Shepard*, Contrib. Min., Amherst, 1876 (Am. J. Sc., III., xii., 231). A substance described as having a fine granular to columnar structure, light orange yellow color. H. = 3.5. G. = 3.95. Anal.: ZnO 81.00, CaO 7.56, CO_2 5.80, H_2O 4.26, MnO tr. = 98.62. Effervesces slightly with acid. From Stirling Hill, New Jersey. [5.8 CO_2 requires CaO 7.4 for $CaCO_3$ —the substance is doubtless a mechanical mixture of zincite and calcite.]

CALEDONITE.—Min., p. 625; App. II., p. 10.

CALLAINITE.—See *Variscite*, p. 128.

CALOMEL, Min., p. 111.—Cryst., El Doctor, Mexico, *Websky*, Ber. Ak. Berlin, 1877, 461.

The occurrence of native corrosive sublimate ($HgCl_2$) is reported by Besnou near Iquique, in the desert of Atacama; the determination, however, was based only on some qualitative trials, Assoc. Franc. Adv. Sc., 1878, 533.

Calvonigrite.—See *Pyrolusite*, p. 99.

CANCRINITE, Min., p. 329; App. II., p. 10.—*Rauff* (Z. Kryst., ii., 456, 1878) has subjected the original cancrinite of Miask to a thorough microscopic and chemical examination, and *A. Koch* (J. Min. Beil. Bd., i, 144, 1880) has done the same for that occurring in the syenite of Ditró, Transylvania. Both show that there is every reason, both as regards the physical characters and the constancy of chemical composition, to consider the mineral as an original species, and not as a decomposition product arising from the action on nephelite of a carbonated solution. The observations of Koch on the behavior of a thin section, when treated with HCl, are especially conclusive as showing that the CO_2 is present, not as calcite mechanically mixed, but as a true element in the composition of the silicate. Analyses: 1, *Rauff*; 2, *Koch*:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	Na ₂ O	K ₂ O	CO ₂	H ₂ O	
1. Miask, G. = 2.450, (2)	37.28	28.20	0.44	6.95	17.75	0.20	6.16	4.03	= 101.01.
2. Ditró	38.58	28.72	tr.	5.24	12.22	5.23	8.78		= 98.77.

The formula deduced by *Rauff* is $Na_8[Al_2]_2Si_3O_{34} + 2Ca(Na_2)CO_3 + 3H_2O$, and that of *Koch* for the Ditró mineral is $Na_8K_2[Al_2]_2Si_{11}O_{41} + 2Ca(Na_2)CO_3 + 4H_2O$. *Rauff* finds the ratio in the carbonate of Ca : $Na_2 = 8 : 1$, and *Koch* 7 : 1.

CARBONYTRINE.—App. II., p. 10.

CARNALLITE.—Min., p. 118; App. II., p. 10.

CARPHOLITE, App. II., p. 10; Min., p. 419.—Anal., *Meuville*, Ardennes, *de Koninck*, Bull. Ac. Belg., II., xlv., 15, 1878; xlvii., 564, 1879.

Caryinite. *C. H. Lundström*, Geol. För. Förh., ii., 178, 223, 1874.

Massive. H. = 3-3.5. G. = 4.25. Lustre greasy. Color brown to yellowish brown. Streak yellowish white. Fracture splintery. Analysis:

As ₂ O ₅	PbO	MnO	FeO	CaO	MgO	CO ₂	Cl	insol.
47.17	10.52	15.82	0.54	16.40	4.25	3.86	0.07	0.65 = 99.28.

This corresponds, though only approximately, to the general formula $R_3As_2O_8$, after deducting the calcium carbonate. B. B. fuses easily to a black slag, giving reactions for arsenic, lead, and manganese. Dissolves readily, with slight effervescence in nitric acid. Occurs intimately mixed with calcite and hausmannite, at Långban, Wermland, Sweden. Named from *καρύινος*, *nut-brown*. *Sjögren* remarks that berzeliite occurs with caryinite, and sometimes enclosing it. He finds the berzeliite isotropic (isometric), and the caryinite anisotrope (monoclinic?), and as the two species have analogous composition, he suggests that the former may have been formed from the latter (Geol. För. Förh., ii, 533, 1875). Lindgren (ib., v., 556, 1881), however, describes the way in which the minerals occur together, and concludes, for certain cases, that the caryinite is altered into berzeliite. [The genetic relation between caryinite and berzeliite merits further examination.]

According to *Des Cloizeaux* (Bull. Soc. Min., iv., 56, 1881), the mineral has two cleavages, at an angle of 130° . $2E = 41^\circ 58'$ to 47° . Dispersion $\rho > \nu$, also horizontal (hence monoclinic).

CASSINITE.—See *Feldspar Group*, p. 45.

CASSITERITE, Min., p. 157; App. II., p. 10.—Cryst. monograph, with a list of all observed planes, also analysis, *Becke*, Min. Mitth., 1877, 244. *Groth*, Min.-Samml., Strassburg, p. 104, 1878. *Schlaggenwald*, v. *Zepharovich*, Lotos, 1880.

Occurrence of tin stones in Cornwall, *Collins*, Min. Mag., iv., 1, 103, 1880. From Coosa Co., Ala., *Shepard*, Am. J. Sc., xx., 56, 1880. From Tasmania, *Gould*, Q. J. G. Soc., xxxi., 109, 18.

CASTILLITE. Not castillite of Rammelsberg (Min., p. 46), but synonym of guanajuatite (q. v., p. 53), *Domeyko*, Min. Chili, 3d Ed., p. 310, 1879.

CASTORITE.—See *Petalite*, p. 91.

CELADONITE, Min., p. 463.—Analyses, in igneous rocks of Scotland, *Hedde*, Trans. Roy. Soc. Ed., xxix., 102, 1879.

Celestialite. *J. Lawrence Smith*, C. R., lxxxi., 1055, 1875. On treating the graphite from the interior of the meteoric iron of Sevier, Tenn., with ether, Smith obtained small quantities of acicular crystals having a peculiar odor, mixed with some small rounded points. These he regards as identical with crystals obtained from the iron of Alais, France (Mar. 15, 1806), by Roscoe (Proc. Lit. Phil. Soc. Manchester, iii., 57, 1863). Smith has obtained the same crystals from the Alais meteorite. In the closed tube he finds that they fuse at 115° – 120° , and at a higher temperature the sulphur is sublimed, and a black residue left behind. He regards these crystals as proof of the presence of a sulpho-hydrocarbon, for which he proposes the name CELESTIALITE. Roscoe (l. c.) found that 1.94 p. c. of the meteorite dissolved in ether, and from the solution he obtained crystals melting at 114° C., and in two forms; acicular, which he considered as near to könlite (Min., p. 737), and rhombic, which he identified as free sulphur.

CELESTITE, Min., p. 619; App. II., p. 10.—Cryst., twins, Sicily, *Kenngott*, J. Min., 1875, 293. *Neminar* (barytocelestite), Min. Mitth., 1876, 59. Cryst. and optical exam., Jühnde, near Göttingen, *Babcock*, J. Min., 1879, 835. Peticara, *Schmidt*, J. Min., 1881, ii., 169 ref., (or Z. Kryst., vi., 99). Ville-sur-Saulx, v. *Lasaulx*, Z. Kryst., v., 203, 1881.

Effect of heat on indices of refraction, *Arzruni*, Z. Kryst., i., 177, 1877. Pyro-electrical characters, *Hankel*, Wied. Ann., vi., 54, 1879.

Anal., occurrence in marl at Bristol, England, *Stoddart*, Min. Mag., i., 4, 1876. Clifton, England (barytocelestite), *Collie*, ib., ii., 220, 1879. Found at Bell's Mills, Blair Co., Pa. (not Frankstown, Huntington Co.). Recent formation at Bourbon d'Archambault, de *Gouvenain*, C. R., lxxx., 1299, 1875.

CENTRALLASSITE, Min., p. 796.—Composition discussed, *How*, Phil. Mag., V., i., 128, 1876.

CERARGYRITE, Min., p. 114; App. II., p. 10.—A mercurial variety of cerargyrite, from the mine "la Julia," of the Cerro de Caracoles, Desert of Atacama, is described by *Domeyko*

(Ann. d. Min., VII., x., 15, 1876; or Min. Chili, 3d Ed., 1879, p. 416). Amorphous, forming irregular masses. Lustre waxy, less brilliant than the pure chloride. Color on the fresh fracture reddish, yellowish, or hair-brown, becoming nearly black on exposure. Malleable and sectile, but less so than ordinary cerargyrite. Can be crushed in a mortar, yielding a bright yellowish powder. The mean of two analyses gave:

Ag	Hg	Cl	NaCl	Fe ₂ O ₃	SiO ₂ (insol.)	CaCO ₃ and loss
66·68	2·20	22·64	1·75	1·60	1·07	[4·06] = 100.
91·53						

According to Moesta, the cerargyrite of Los Bordos, Copiapo, contains 1·31 p. c. of mercury.

CERBOLITE.—App. II., p. 10.

CERITE, Min., p. 413; App. II., p. 10.—Anal. by *Stolba* and *Kettner*, of cerite from Bastnäs, giving: SiO₂ 18·18, Ce₂O₃ 33·25, La₂O₃ + Di₂O₃ 34·60, FeO 3·18, CaO 1·69, H₂O 5·18 = 96·08, Ber. Böhm. Ges., p. 372, 1879.

CERUSSITE, Min., p. 700; App. II., p. 11.—Cryst., twins, *Sadebeck*, Pogg. Ann., clvi., 558, 1875. *Groth*, Min.-Samml., Strassburg, p. 133, 1878. Rodna, Transylvania, *Vrba*, Z. Kryst., ii., 157, 1878; *Krenner*, ib., ii., 304. Mine Friedrichsregen, near Ems, Nassau, *Seligmann*, Verh. Nat. Ver. Bonn, xxxiii., 244, 1876, and xxxv., 175, 1878; also *J. Min.*, 1880, i., 137. *Bleiberg, v. Zepharovich*, Lotos, 1878.

Recent formation at Pompeii, *de Luca*, C. R., lxxxiv., 1457, 1877.

CERVANTITE, Min., p. 187.—Occurrence in Sevier Co., Ark., *Dunnington*, Amer. Assoc., 1877, 182.

CHABAZITE, Min., p. 434; App. II., p. 11.—*Becke* has studied minutely the optical characters of chabazite crystals from different localities, and concludes that the long recognized optical anomalies are to be explained by the assumption of a complicated twinning of triclinic individuals; this twinning, however, is according to the accepted principles (analogous to aragonite), and does not require any new hypothesis as that of *Mallard*. He finds, for example, that a basal section in polarized light shows a composition of six differently orientated individuals, of which the extinction directions of two neighboring portions are symmetrically arranged with reference to the line of union. A section parallel to a rhombohedral plane, under the same conditions, is divided into two parts along the shorter diagonal. For further details see the original paper (*Min. Petr. Mitth.*, ii., 391, 1879), or the abstracts (*Z. Kryst.*, v., 377, and *J. Min.*, 1880, ii., 135). *Streng* (see below) also discusses the same problem, but without arriving at so definite a conclusion. *Becke* finds gmelinite related in structure to chabazite, while *herschelite* (q. v.) differs from both, and to the latter *levynite* is probably related. *Des Cloizeaux* (*Bull. Soc. Min.*, iv., 259, 1881) has examined optically the *haydenite* of Baltimore, double-refraction positive.

Discussion of chemical composition with several analyses (by *Burkhardt* and *Hammerschlag*), *Streng*, Ber. Oberhess. Ges., xvi., 74, 1877 (abstr., *Z. Kryst.*, i., 519, 1877); he shows the variation in composition (e. g. of 4·4 p. c. in SiO₂), and argues from it that this and the related species (*phacolite*, *gmelinite*, *levynite*) may be regarded as varying isomorphous mixtures of two end compounds, as has been assumed in the case of the triclinic feldspars.

Anal., *Csödi*berg, Hungary, *Koch*, ZS. G. Ges., xxviii., 304, 1876. Lausanne, in a gelatinous condition (*Bischoff*), *Renévier*, Bull. Soc. Vaud., II., xvi., 15, 1879. Branchville, Conn. (Penfield), *Brush* and *Dana*, Am. J. Sc., xviii., 49, 1879. Elba, *Sansoni*, Att. Soc. Tosc., iv., 316, 1879.

Recent formation at Bourbonne-les-Bains, *Daubrée*, C. R., lxxx., 606, 1875; at Oran, *Algiers*, ib., lxxxiv., 157, 1877.

CHALCOCITE, Min., p. 52.—Recent formation at Bourbonne-les-Bains, *Daubrée*, C. R., lxxx., 462, 1875; see also xciii., 572, 1861.

Chalcomenite, *Des Cloizeaux and Damour*, Bull. Soc. Min., iv., 51, 1881.

Monoclinic; in isolated crystals and crystalline crusts. $I \wedge I = 108^\circ 20'$. $O \wedge i-i = 89^\circ 9'$. Commonly in prismatic crystals terminated by the basal plane and $1-i$. Optic axial plane parallel, and acute (negative) bisectrix perpendicular, to the horizontal edge $O | i-i$. Angle small, dispersion strong $\rho < \nu$; so that in the polariscope with a green glass the lemniscates have the form of circular rings traversed by a black cross, while with a blue glass they take the form of ellipses elongated normal to the plane of polarization. $G. = 3.76$. Color bright blue. Transparent. Analysis, Damour (Bull. Soc. Min., iv., 167, 1881):

SeO ₂	CuO	H ₂ O
48.12	35.40	15.30 = 98.82.

Corresponding to the formula $\text{CuSeO}_3 + 2\text{aq}$ or a copper selenite, an example of a group of compounds not before met with in mineralogy. B. B. on charcoal fuses to a black slag, giving off selenium fumes, and coloring the flame deep blue. In the closed tube yields a little water and a sublimate of SeO₂ in white needles. In salt of phosphorus gives in O. F. a greenish blue glass, which becomes blood-red when reduced with the addition of metallic tin. Soluble in acids.

Occurs in minute crystals in the various selenides of silver, copper, and lead, which are found in small veins; Cerro de Cacheuta, Mendoza, Argentine Republic. Often intimately mixed with azurite, iron oxide, and lead carbonate, which have been formed by the alteration of the selenides and of the pyrites which form the gangue.

MM. Friedel and Sarasin have succeeded in forming artificially (Bull. Soc. Min., iv., 176, 225, 1881) a copper selenite having the same form and composition as chalcomenite, and another differing in crystalline form.

CHALCOMICLITE.—App. II., p. 11.

CHALCOMORPHITE.—App. II., p. 11.

Chalcophanite. *G. E. Moore*, Amer. Chemist, July, 1875.

Rhombohedral; in druses of minute tabular crystals. $R \wedge R = 114^\circ 30'$, $R \wedge O = 103^\circ 48'$; $\epsilon = 3.5267$. Also in foliated aggregates; in stalactitic and plumose forms. Cleavage basal perfect. $H. = 2.5$. $G. = 3.907$. Lustre metallic, brilliant. Color bluish to iron black. Streak chocolate brown, dull. Opaque. Flexible in thin laminae. Analyses: 1, of crystals; 2, of the stalactitic form:

	MnO ₂	MnO	ZnO	Fe ₂ O ₃	H ₂ O
1.	59.94	6.58	(3) 21.70	0.25	11.58 = 100.05.
2.*	(3) 61.57	4.41	20.80	....	12.66 = 99.44.

* After deduction of 1.27 p. c. limonite as impurity.

Formula $(\text{Mn, Zn})\text{O} + 2\text{MnO}_2 + 2\text{aq}$. If half the water be made basic, the formula may be written $2(\overset{\text{II}}{\text{R}} + \overset{\text{IV}}{\text{R}})\text{O}_3 + \text{aq}$, which is equivalent to $2[\text{R}_2]\text{O}_3 + \text{aq}$. In the closed tube gives off water and oxygen, exfoliates slowly, and changes to a golden bronze color. B. B. becomes yellowish bronze to copper red in color, and fuses slightly on the edges. With borax a manganese bead; on charcoal with soda a zinc coating.

Occurs at the calamine deposits of Sterling Hill, N. J. It is a product of the decomposition of franklinite. Named from *χαλκός*, brass, and *φαίνω*, to appear, in allusion to the change of color on ignition.

CHALCOPYRITE, Min., p. 65; App. II., p. 11.—**Cryst.**, v. *Kökscharof*, Bull., Soc. St. Pet., xix., 562, 1875. With tetrahedrite in parallel position, *Sadebeck*, Ber. Ges. Nat. Fr. Berlin, Oct., 1878 (J. Min., 1879, 154). *Groth*, Min.-Samml., Strassburg, p. 53, 1878.

Recent formation at Bourbonne-les-Bains, *Daubrée*, C. R., lxxx., 463, 1875; do. at Bourbon d'Archambault, *de Gouvenain*, ib., p. 1297.

CHALCOPYREHOTITE.—App. II., p. 11.

CHALCOSIDERITE. *Maskelyne* (J. Ch. Soc., July, 1875) identifies a mineral from Cornwall with the chalcosiderite of Ullmann, and shows it to be a distinct species, and not to be united with dufrénite (see Min., p. 583). Occurs in minute triclinic crystals, generally in sheaf-like groups. Cleavage easy in one direction. $H. = 4.5$. $G. = 3.108$. Color light siskin green. Analysis, Flight (l. c.):

P_2O_5	As_2O_5	Fe_2O_3	Al_2O_3	CuO	H_2O^*	U_2O_3
29.93	0.61	42.81	4.45	8.15	15.00	tr. = 100.95.

* Loss at $100^\circ C.$ 0.46, at 120° – 130° additional loss 0.13; remainder at a red heat.

Composition expressed by the formula $2[Fe_2]P_2O_8 + [Fe_2]H_6O_6 + CuH_2O_2 + 4aq$. Implanted on andrewsite at the West Phoenix mine, Cornwall.

CHALYPITE.—App. II., p. 11.

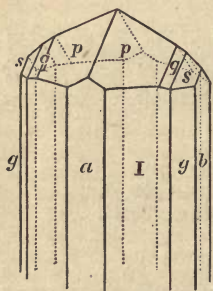
CHILDRENITE, Min., p. 579; App. II., p. 11.—Tavistock, Cornwall, analyses by *S. L. Penfield*, Am. J. Sc. III., xix., 315, 1880:

	P_2O_5	Al_2O_3	FeO	MnO	CaO	H_2O	Quartz.
1.	30.19	21.17	26.54	4.87	1.21	15.87	0.10 = 99.95.
2.	29.98	21.44	26.20	....	....	....	....

Penfield removes the doubt as to the true composition of childrenite, the formula deduced being $R_2Al_2P_2O_{10}, 4H_2O$ or $Al_2P_2O_8 + 2RH_2O_2 + 2aq$. This requires P_2O_5 30.80, Al_2O_3 22.31, FeO 26.37, MnO 4.87, H_2O 15.65. It also follows from this that childrenite and eosphorite (see below) are essentially the same species.

CHILDRENITE—EOSPHORITE. *G. J. Brush* and *E. S. Dana*, Am. J. Sci., III., xvi., 35, 1878; xviii., 47, 1879.

Orthorhombic. Axes, $c : b : a = 0.66209 : 1.28732 : 1$. Observed planes (see figure): $i-\bar{i}$ (a), $i-\bar{i}$ (b), $I, i-\bar{2}$ (g), 1 (p), $\frac{3}{2}-\frac{3}{2}$ (q), $2-\bar{2}$ (s). $I \wedge I = 104^\circ 19'$, $p \wedge p$ (front) = $133^\circ 32'$, $p \wedge p$ (side) = $118^\circ 58'$, $a \wedge p = 120^\circ 31'$. In prismatic crystals vertically striated. Also more generally massive, cleavable to closely compact. Cleavage: macrodiagonal nearly perfect.



$H. = 5$. $G. = 3.11$ – 3.145 . Lustre vitreous to sub-resinous, of massive mineral often greasy. Color rose-pink, yellowish to colorless, also of compact forms grayish, bluish, yellowish white, and white. Streak white. Transparent to translucent. Fracture uneven to subconchoidal. Optic axial plane macrodiagonal; acute bisectrix negative, normal to brachypinacoid. Axial angle in air $54^\circ 30'$ red, $60^\circ 30'$ blue. Axial colors yellowish ($\parallel \bar{b}$), deep pink ($\parallel \bar{a}$), faint pink to nearly colorless ($\parallel \bar{c}$).

Composition: $R_2Al_2P_2O_{10}, 4H_2O$ or $Al_2P_2O_8 + 2RH_2O_2 + 2aq$. If $R = Mn : Fe = 10 : 3$, percentage composition: P_2O_5 30.93, Al_2O_3 22.35, FeO 7.24, MnO 23.80, H_2O 15.68 = 100. Analyses: 1, *S. L. Penfield* (Am. J. Sc., xvi., 40), pure crystals, $G. = 3.134$; 2, *H. L. Wells* (xvi., 41), white compact mineral, containing 14.41 p. c. impurities, mostly quartz, here deducted; 3, *H. L. Wells* (xviii., 48), pink massive mineral, $G. = 3.11$.

	P_2O_5	Al_2O_3	FeO	MnO	CaO	Na_2O	H_2O
1. ($\frac{3}{2}$)	31.05	22.19	7.40	23.51	0.54	0.33	15.60 = 100.62, Penfield.
2.	31.43	21.83	6.84	22.43	3.01	....	15.07 = 100.61, Wells.
3.	31.39	21.34	6.62	22.92	1.48	....	15.28, insol. 1.46 = 100.49, Wells.

In the closed tube decrepitates, whitens, gives off abundance of neutral water, and the residue turns first black, then gray, and finally liver brown with a metallic lustre, and becomes magnetic. B. B. in the forceps cracks open, sprouts and whitens, colors the flame pale green, and fuses at about 4 to a black magnetic mass. Reacts for iron and manganese with the fluxes. Soluble in acids.

Occurs at Branchville, Fairfield Co., Conn., in a vein of pegmatite associated with rhodo-

chrosite and the manganesian phosphates, triploidite, dickinsonite, lithiophilite. Also as imbedded nodules (anal. 3, above), in a massive green chloritic mineral. The massive mineral (anal. 2, above, G. = 2.92-3.08) often impure from the presence of quartz, dickinsonite, and apatite. Named from *εωσφόρος* (synonym of *φωσφόρος*) which means *dawn-bearing*, in allusion to the characteristic pink color.

[Since the hitherto uncertain composition of childrenite (q. v.) has been settled by Penfield, it appears that esophorite and childrenite, having similar form and composition, are essentially the same mineral, only differing in that the first contains mostly manganese and the second mostly iron.]

Chloralluminite. *Scacchi*, Att. Accad. Napoli, vi. (read Dec. 13, 1873). Aluminum chloride ($Al_2Cl_6 + xH_2O$), produced with molisite and chloromagnesite, at Vesuvius, at the eruption of April, 1872.

CHLORASTROLITE.—See *Prehnite*, p. 96.

CHLORITE. Pseudomorph after garnet, Lake Superior, *Pumpelly*, Am. J. Sc., III., x., 17, 1875.

Chemical monograph of the "Chlorite Group," *Heddle*, Trans. Roy. Soc. Ed., xxix., 55 et seq., 1879.

CHLORITOID, Min., p. 504.—See *Clintonite*, p. 28.

CHLOROCALCITE, App. II., p. 11.—*Scacchi*, Att. Accad. Napoli, vi., 1873.

Calcium chloride, from Guy's Cliff, Warwickshire, *Spiller*, J. Ch. Soc., p. 154, Feb., 1876. Calcium chloride, more or less mixed with clay, has been identified in the Province of Tarapaca, of Chinchá, and elsewhere in Peru, by *Raimondi* (Min. Pérou, p. 267, 1878); it was called HYDROPHILITE by Adam.

Chloromagnesite. *Scacchi*, Att. Accad. Napoli, vi., 1873. Magnesium chloride ($MgCl_2 + xaq$), formed at Vesuvius at the eruption of April, 1872.

A mineral, apparently identical with that of *Scacchi*, has been called BISCHOFITE by *Ochsenius* and *Pfeiffer*, Arch. Pharm., III., xi., 296, 1877 (Bull. Soc. Min., i., 128, 1878, and Jahresb. Ch., 1877, 1284, 1285). Crystalline-granular and foliated, sometimes fibrous. H. = 1-2. G. = 1.65. Colorless (pure) to white. Lustre vitreous to dull. Mean of two analyses by König gave: Mg 11.86, Cl 35.04, H₂O 53.10 = 100; this corresponds to $MgCl_2 + 6aq$, requiring Mg 11.83, Cl 34.95, H₂O 53.22. Soluble in 0.6 parts of cold water. Occurs in layers 2-3 cm. thick in halite, with kieserite and carnallite, fibres transverse to the layers; Leopoldshall, Prussia. The assumption of water is said to commence as soon as the layer is exposed to the air. The artificial salt is monoclinic.

CHLOROPAL, Min., p. 461.—*Anal.*, Mugrau, Bohemia, *Schrauf*, J. Min., 1877, 255. Mudgee, New South Wales, *Liversidge*, Proc. Roy. Soc. N. S. W., Nov. 3, 1880. A related mineral from Sweden, *Weibull*, Geol. För. Förh., v., 627, 1881.

Composition of related minerals discussed, *Collins*, Min. Mag., i., 67, 1877.

CHLOROPHÆITE, Min., p. 510.—*Anal.*, from the Seuir More ridge, in Rum, Scotland, *Heddle* (Trans. Soc. Edinb., xxix., 84, 1879): SiO₂ 36.00, Fe₂O₃ 22.80, FeO 2.46, MnO 0.50, CaO 2.52, MgO 9.50, alkalis tr., H₂O 26.46 = 100.25 (H₂O at 100° 19.23).

Chlorothionite, *Scacchi*, Att. Accad. Napoli, vi., 1873 (Contrib. Min., ii., p. 59).

Occurs in thin crystalline mammillary crusts of a bright blue color. An analysis gave: SO₂ 32.99, Cl 20.04, Cu 19.56, K 26.29, loss 1.12 = 100. Crystals obtained by recrystallization from a solution, and thus purer than the original material, gave essentially the same result. The composition is expressed by the formula $K_2SO_4 + CuCl_2$, which requires: SO₂ 31.12, Cl 22.98, Cu 20.55, K 25.35 = 100. From Vesuvius, as a result of the eruption of April, 1872. The name records the presence of chlorine and sulphur (*θειον*). [Is not this a mixture of two salts?]

Chlorotile. *Frenzel*, *Min. Mitth.*, 1875, 42; *J. Min.*, 1875, 517.

In minute capillary crystals of prismatic habit (orthorhombic), also fibrous and massive; soft. Color in the mass pale green to emerald green, microscopic crystals colorless. Transparent. Composition asserted to be $\text{Cu}_3\text{As}_2\text{O}_8 + 6\text{aq}$; an approximate analysis gave: As_2O_5 41, CuO 41, H_2O 18 = 100. Occurs with aragonite and wapperite, at Schneberg, and with quartz and scheelite at Zinnwald. [A more complete description is to be desired.]

CHONDRODITE, *Min.*, p. 363; *App. II.*, p. 12.—**Cryst.**, Brewster, N. Y., monograph by *E. S. Dana*, proving the presence of crystals corresponding to each of the so-called "types" of the Vesuvian humite; also giving measurements and many occurring planes. Further, it is shown, that the optical characters of the crystals of the more common "second type" prove them to be, in fact, *monoclinic*: the axes lie in the plane of symmetry, axial plane inclined $25^\circ 48'$ to the basal plane, $2H_{ap} = 83^\circ 48'$ ($n = 1.466$), *Conn. Acad.*, iii., 67-96, 1875 (abstr. in *Am. J. Sc.*, III., x., 89). It has also been proved by the same author, that the crystals of the "third type" belong to the monoclinic system (*Am. J. Sc.*, III., xi., 139, 1876). The measured angles alone, however, would not imply any variation from the orthorhombic type, although it has long been observed that the hemihedral development of the planes was in accordance with monoclinic symmetry.

The corresponding Vesuvian species, **HUMITE**, has been studied by *Des Cloizeaux* (*Phil. Mag.*, III., ii., 286, 1876, and iii., 357, 1877; or see *J. Min.*, 1876, 641; 1877, 500) and by *Klein* (*J. Min.*, 1876, 633). *Des Cloizeaux* finds the three types of humite to be optically distinct, and proposes to retain for the "first type," which he shows to be orthorhombic, the name **HUMITE**; for the "second type," which he finds to be monoclinic, he reverts the name **CHONDRODITE**, and to the "third type," also monoclinic, he gives the name **CLINO-HUMITE** (the observations on the second and third types confirm those of *E. S. Dana* on Brewster crystals). *Klein* (l. c.) obtained for third type crystals of humite (*clinohumite*) results agreeing with those of *Des Cloizeaux*.

Sjögren describes crystals from the Ladu mine, Wermland, Sweden, which are holohedral orthorhombic, and near in angle to "Type I." of the Vesuvian mineral, also others from Kafveltorp, Westmanland, which are monoclinic, and similar (see above) to common chondrodite, *Gefv. Ak. Stockh.*, xxxviii., 5, p. 29, 1881. An exhaustive monograph of the Kafveltorp chondrodite is given by the same author in vol. xvii. of the *Lund. Univ. Årskrift* (abstr. in *Geol. För. Förh.*, v., 655, 1881).

Analyses and discussion of composition: Brewster, N. Y., *Hawes*, *Am. J. Sc.*, III., x., 96, 1875; Kafveltorp, Sweden, *Widman*, *Geol. För. Förh.*, iii., 113, 1876; *Websky*, *Ber. Ak. Berlin*, 1876, 201; Pargas, Finland, *Berwerth*, *Min. Mitth.*, 1877, 272.

CHROMITE, *Min.*, p. 153; *App. II.*, p. 12.—In thin sections not opaque, but transmits a yellowish-red color, according to *Thoulet*, *Bull. Soc. Min.*, ii., 34, 1879. See also *Fischer*, *Mikr. Stud.*, 1870, and *Z. Kryst.*, iv., 363.

Anal., platinum washings, Wisimo Schaitansk, Ural, *Waller*, *Gefv. Ak. Stockh.*, xxxiii., No. 10, p. 23, 1876.

Occurrence in meteorites, *J. Lawrence Smith*, *Am. J. Sc.*, III., xxi., 461, 1881.

Chromowulfenite.—See *Wulfenite*, p. 132.

CHROMPICOTITE.—*App. I.*, p. 3.

CHRYSOBERYL, *Min.*, p. 155; *App. II.*, p. 12.—Specific gravity determinations, *Church*, *Geol. Mag.*, II., ii., 321, 1875.

CHRYSOCOLLA, *Min.*, p. 402.—An aluminous variety of chrysocolla is called **PILARITE** by *Kramberger* (*Z. Kryst.*, v., 260, 1880). Like chrysocolla in appearance. Apparently homogeneous under the microscope. $H. = 3$. $G. = 2.62$. Lustre dull. Color light greenish blue. Analysis ($\frac{2}{3}$): SiO_2 38.6, Al_2O_3 16.9, CuO 19.0, CaO 2.5, ign. 21.7 = 98.7. Locality, Chili. Named after Prof. Pilar in Agram.

J. R. Santos (*Chem. News*, xxxvi., 167, 1876) has analyzed an aluminous chrysocolla from Utah: SiO_2 37.19, Al_2O_3 10.78, CuO 26.03, H_2O 25.76 = 99.76. König describes a substance from Bergen's Ranch, 25 m. from Denver, Col., forming a thin, slightly bluish

crust on limonite; it contains 33.85 p. c. Al_2O_3 , 5.40 CuO, and corresponds to allophane and chrysocolla in the ratio of 5 : 1, probably to be regarded as a mixture, Proc. Ac. Nat. Sc. Philad., 1877, 294. See also *Semmons*, Min. Mag., ii., 197, 1879.

Other analyses, Lower California, *Hutchings*, Chem. News, xxxvi., 18, 1877; also xxxiv., 141, 1876; Cerro Blanco, Chili, *Pellegrini*, Z. Kryst., iv., 408; Wheco, New South Wales, *Liversidge*, Proc. Roy. Soc. N. S. W., Nov. 3, 1880.

CHRYSLITE, Min., p. 256; App. II., p. 12.—Vesuvius (hyalosiderite), *Scacchi*, Att. Acc. Nap., vi., 1873 (Contr. Min., II., 66); with humite (clinohumite) crystals in parallel position, *Scacchi*, J. Min., 1876, 637. Determinations of specific gravity, *Church*, Geol. Mag., II., ii., 321, 1875.

Anal., Skurruvuselv, Norway, *Hjortdahl* (Z. Kryst., ii., 305). Zermatt, with 6 p. c. TiO_2 (titanolivine, Groth), *Damour*, Bull. Soc. Min., ii., 15, 1879. In meteoric iron of Bragin, Retschinsk, *Inostranzef*, Min. Russl., vi., 216; Ste. Anne, Ottawa River, Canada, *Harrington*, Geol. Canada, 1878.

A variety is called NEOCHRYSLITE, by *Scacchi* (Rend. Accad. Napoli, Oct. 14, 1876). In small, black, crystalline plates, crystallographically identical with chrysolite. Peculiar in containing a considerable amount of manganese (compare hortonolite). Found in the cavities of the lava of 1631, at the Cupa di Sabataniello, Vesuvius.

CHRYSOPHITE.—See *Sphalerite*, p. 111.

CIMOLITE, Min., p. 457.—**Anal.**, Richmond, N. S. W., *Liversidge*, Proc. Roy. Soc. New South Wales, Dec. 6, 1876.

CINNABAR, Min., p. 55; App. II., p. 12.—**Cryst.**, v. *Kokscharof*, Min. Russl., vi., 257, 1875. With metacinnabarite, Reddington mine, Cal., *Bertrand*, Z. Kryst., ii., 199, 1877. Tuscany, *d'Achiardi*, Att. Soc. Tosc., iii., 232, 1877.

Anal., Oregon, *Dabney*, Chem. News, xxxiv., 180, 1876.

Occurrence in California, etc., *Blake*, Bull. Soc. Min., i., 81, 1878; Rolland, *ib.*, i., 98. Genesis, etc., *Christy*, Am. J. Sc., III., xvii., 453, 1879; Mernyk, Hungary, *Krenner*, Z. Kryst., ii., 304.

CLARITE, App. II., p. 12.—*Sandberger*, J. Min., 1875, 382.

Monoclinic (?). Crystals in tufted groups, on account of alteration not to be measured; planes identified *O*, *i-l*, *I*, *m*. Cleavage *i-l* perfect, *i-i* less so. H. = 3.5. G. = 4.46. Color dark lead gray. Streak black. Analysis, Petersen.

S	As	Sb	Cu	Fe	Zn
32.92	17.74	1.09	46.29	0.83	tr = 98.87.

Formula that of enargite, viz.: $Cu_3AsS_4 = 3Cu_2S + As_2S_5$.

B. B. fuses easily; in the closed tube decrepitates violently, and gives a reddish yellow sublimate of the sulphide of arsenic (and antimony), with also one of sulphur; in the open tube gives both As_2O_3 and Sb_2O_3 . Soluble in nitric acid, with the separation of a white precipitate; not attacked by boiling in a solution of caustic potash. Occurs on barite from the Clara mine, near Schapbach, Baden. Sometimes altered to chalcopyrite and covellite. [Clarite and luzonite have both the composition of enargite; the former differs from it in color, and apparently in form; the latter in color and absence of cleavage, form unknown. All three have essentially the same specific gravity, which is not ordinarily the case with well established trimorphous groups—a further examination seems to be required to prove that they are in fact distinct.]

CLAUSTHALITE.—Min., p. 497; App. II., 12.

Cleveite. *Nordenskiöld*, Geol. För. Förh., iv., 28, 1878.

Isometric; in cubes with octahedron and dodecahedron; crystals rare, also in irregular grains. H. = 5.5. G. = 7.49. Lustre dull. Color iron black. Streak blackish brown.

Opaque. Analysis, G. Lindström (l. c.), after deducting 2·34 p. c. insol., and 0·86 CaO, 0·14 MgO :

U ₂ O ₃	Y ₂ O ₃	Er ₂ O ₃	Ce ₂ O ₃	Fe ₂ O ₃	ThO ₂	PbO	UO	H ₂ O
42·04	6·87	3·47	2·33	1·05	4·76	11·31	23·89	4·28 = 100.

The suggestion is made that the formula may be (RO)(R₂O₃)H₂O, and the mineral a member of the spinel group, altered through the assumption of water, but this seems very doubtful. In the closed tube gives off water. B. B. infusible. With salt of phosphorus a deep green bead, becoming yellow in O. F. after long blowing. Easily soluble in hydrochloric acid with the separation of lead chloride. With soda on charcoal, a lead globule and a coating of lead oxide. Occurs in a dirty brown feldspar at Garta, near Arendal, Norway. Associated with orthite, fergusonite, thorite, etc. Named after Prof. Cleve.

At the same locality is found a mineral which is probably a final decomposition product of cleveite. It is called YTTROGUMMITE. It has the appearance of orangite. Lustre brilliant. Color black to yellow. Translucent; fracture conchoidal. Optically anisotrope. H. = 5. Hydrous, contains yttrium and uranium oxides. Between the black opaque cleveite and the translucent honey yellow yttrogummite, occur many intermediate products. [Cleveite is closely related to uraninite, as is yttrogummite to ordinary gummite.]

Clinocrocite (*Sandberger*), *Singer*, Inaug. Diss., Würzburg, 1879, p. 9. A mineral of a deep saffron yellow, occurring in microscopic crystals (·02 mm. broad), which are probably monoclinic, with the planes *I*, *O*, 1-*i*. According to a qualitative examination, a hydrous sulphate of alumina, iron sesquioxide, soda, and potash (lime in traces). From the Bauersberg, near Bischofsheim, formed by the decomposition of pyrite in basalt tufa. Related to the more clearly defined mineral, *clinophæite* (q. v.). [Needs further examination.]

Clinohumite.—See *Chondrodite*, p. 26.

Clinophæite (*Sandberger*), *Singer*, Inaug. Diss., Würzburg, 1879, p. 16. In microscopic crystals (·02 mm. broad), probably monoclinic, with planes *O*, *I*, 1-*i*, prismatic angle 85°. H. = ? G. = 2·979. Color blackish green. Streak light grayish green. Lustre vitreous. Translucent to opaque. Taste astringent. An analysis gave (after deducting 7·88 p. c. hygroscopic water) :

SO ₃	Fe ₂ O ₃	Al ₂ O ₃	FeO	NiO(CoO)	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O
37·01	9·48	4·04	6·06	0·76	1·88	0·77	6·35	21·79	14·72 = 102·86.

The formula deduced is 5R₂SO₄ + [R₂]H₆O₆ + 5aq. Difficultly soluble in water; on boiling, iron sesquioxide separates from the aqueous solution. B. B. fuses with intumescence, leaving finally a black magnetic residue. Occurs with other sulphates at the Bauersberg, near Bischofsheim, as a result of the decomposition of pyrite.

CLINTONITE, Min., p. 508.—The "clintonite group" of minerals have been investigated by *Tschermak* and *Sipőcz* (Ber. Ak. Wien, lxxviii., Nov., 1878; or Z. Kryst., iii., 496). In this group of "brittle micas" (*Sprödglimmer*) the authors include seybertite (clintonite), brandisite, xanthophyllite, also chloritoid, masonite, ottrelite, sismondine, and sapphire. All of these species belong to the monoclinic system, and in form and physical character they are closely related to the micas, more especially to margarite (see original memoir and p. 77).

Chemically, it is assumed that the first three of these minerals are isomorphous mixtures of H₄Ca₂Mg₃Si₆O₂₄ and H₂CaMgAl₆O₁₂: in *seybertite* in the ratio of 4 : 5, in *brandisite* of 3 : 4, in *xanthophyllite* of 5 : 8. As the two compounds assumed are not known to have an independent existence, the results reached are hypothetical. In order to bring out the relation which is supposed to exist between the micas, margarite, and seybertite, the following scheme is given, representing the compounds which are assumed to enter into their composition :

Mica.	Margarite.	Seybertite.
H ₄ Al ₆ Si ₆ O ₂₄ }	H ₆ Al ₆ Si ₆ O ₂₄ }	H ₄ Ca ₂ Mg ₃ Si ₆ O ₂₄ }
Mg ₁₂ Si ₆ O ₂₄ }	Ca ₃ Al ₆ O ₁₂ }	H ₂ CaMgAl ₆ O ₁₂ }

Chloritoid (chloritspath) is also monoclinic, and related in form to meroxene, as well as to the above species; composition expressed by the formula $H_2Fe_2Si_2O_7 + H_2Al_2O_7$.

Ottrelite and *masonite* are regarded as very near to chloritoid, the variation in chemical composition being believed to be due to foreign inclosures.

Sismondine is similar to chloritoid, and the formula corresponding to the analysis below is $H_{14}Fe_4Al_{10}Si_6O_{54}$, with, however, the Fe in part replaced by Mg. For sapphirine the formula $Mg_2Si_2O_6 + Mg_2Al_6O_{11}$ is given.

Analyses: 1, 2, 3, by L. Sipőcz—1, seybertite from Amity, G. = 3·102; 2, brandisite from Monzoni, G. = 3·090; 3, chloritoid from Pregratten, G. = 3·538; 4, by W. Suida, sismondine from St. Marcel, G. = 3·42.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	H ₂ O	F	
1. <i>Seybertite</i>	19·19	39·73	0·61	1·88	21·09	13·11	4·85	1·26	= 101·72.
2. <i>Brandisite</i>	18·75	39·10	3·24	1·62	20·46	12·14	5·35	....	= 100·66.
3. <i>Chloritoid</i>	24·90	40·99	0·55	24·28	3·33	....	7·82	....	= 101·87.
4. <i>Sismondine</i>	26·03	42·33	4·09	14·32	7·30	0·25	6·53	alk. tr.	= 100·98.

On a variety of xanthophyllite called **WALUEWITE**, see p. 132: on a variety of ottrelite called **VENASQUITE**, see p. 87.

COBALTITE, Min., p. 71; App. II., p. 13.—**Cryst.**, Tunaberg and Skutterud, *Groth*, Min.-Samml., Strassburg, p. 41, 1878.

Anal., Khetri mines, Rajputana, India, *F. R. Mallet*, Rec. Geol. Surv. India, xiv., pt. 2, 190, 1880.

CERULEOLACTITE.—App. I., p. 3; II., p. 13.

Coloradoite, *F. A. Genth*, Amer. Phil. Soc., xvii., 115, 1877 (or Z. Kryst., ii., 4).

Massive; granular, sometimes imperfectly columnar (due to admixed sylvanite?). H. = 3. G. = 8·627. Lustre metallic. Color iron-black inclining to gray. Fracture uneven to subconchoidal. Composition HgTe = tellurium 39·02, mercury 60·98 = 100. Analyses; 1, 2, 3, 4, 5, Keystone mine; 6, 7, Smuggler mine.

	Quartz and gold deducted.	Te	Hg	Al ₂ O ₃ , Fe ₂ O ₃	V ₂ O ₅	MgO	CaO	
1.	[23·50]	43·81	56·33	tr.	tr.	tr.	tr.	= 100·14.
2.	[46·83]	42·95	52·28	2·44	0·70	0·11	0·84	= 99·32.
3.	[25·18]	44·25	51·48					undet.
4.	[8·46]	46·74	49·80					undet.
5.	[20·72]	50·05	45·63					undet.
	Quartz deducted.							
6.	[2·90]	36·24	55·80	Au 3·46, Ag 2·42, Fe 1·35, Cu, Zn tr.				= 99·27.
7.	[3·05]	34·49	48·74	Au 7·67, Ag 7·18, Cu 0·16, Fe 0·92, Zn 0·50				= 99·66.

The impurities present in 1 to 5 are, besides gold and quartz, native tellurium in varying quantities; in 6 and 7 also sylvanite. In the tube slightly decrepitates, fuses, and yields metallic mercury as a sublimate, also tellurium trioxide in drops, and next to the assay metallic tellurium. Soluble in nitric acid.

Occurs very sparingly at the Keystone, Mountain Lion, and Smuggler mines, in Colorado. [Belongs in the same group with cinnabar (or metacinnabarite) HgS, and tiemannite HgSe.]

COLUMBITE, Min., p. 515; App. II., p. 13.—**Cryst.**, Riesengebirge, *Scharizer*, Verh. G. Reichs., 1879, 243.

Analyses, Yancey Co., N. C.; Pike's Peak, Col., *J. L. Smith*, Am. J. Sc., III., xiii., 359, 1877. Isergebirge, *Janovsky*, Ber. Ak. Wien, lxxx., 34, 1879. Middletown, Ct., *E. J. Hallock*, Am. J. Sc., xxi., 412, 1881.

The following analyses are quoted here as being of especial interest: 1, Standish, Me.,

O. D. Allen (priv. contrib.); 2, Northfield, Mass., *W. J. Comstock*, *Am. J. Sc.*, III., xix., 181, 1880; 3, Branchville, Conn., *Comstock*, *ib.*

		Cb_2O_5	Ta_2O_5	SnO_2 , WO_3	MnO	FeO	CaO	
1. Standish,	G. = 5.65	68.99	9.22	1.61	3.65	16.80	...	= 100.27.
2. Northfield,	G. = 6.84($\frac{2}{3}$)	26.81	56.90	...	5.88	10.05	...	= 99.64.
3. Branchville,	G. = 6.59	30.16	52.29	...	15.58	0.43	0.37	= 98.83.

The Standish crystals are small, but highly modified, and of brilliant lustre (see *Z. Kryst.*, i., 380). The Northfield mineral had the form and habit of ordinary columbite, though it is essentially a tantalite. This was also true of the Branchville mineral (*Brush* and *Dana*, *Am. J. Sc.*, III., xvi., 34, 1878), which, moreover, was in thin tabular crystals, slightly translucent; it is also remarkable as containing only MnO, and also in the fact that the ratio of Cb_2O_5 : Ta_2O_5 = 1 : 1 nearly, that is, the formula is $\text{MnCb}_2\text{O}_6 + \text{MnTa}_2\text{O}_6$. See also *Tantalite*, p. 118.

Shepard's HERMANNOLITE (*Am. J. Sc.*, II., i., 90, 1870; III., xi., 140, *Hermann*, *J. Pr. Ch.*, II., xiii., 386, 1876, or *Bull. Soc. Mosc.*, xlix., 179, 1875; *Delafontaine*, *Am. J. Sc.*, III., xiii., 390, 1877, and *Bibl. Univ. Gen.*, II., lix., 184, 1877) is a mineral from Haddam, Conn., related to (or identical with) columbite. Hermann (l. c.) finds in it "hypotantallic acid 7.08, hypotilmenic acid 14.92, niobous acid 56.15, iron protoxide, 12.56, manganese protoxide 9.34 = 100." This result is, to say the least, problematical, as no one but the analyst himself has any confidence in the existence of the chemical compounds named. Delafontaine (l. c.) found a large proportion of Cb_2O_5 , about 16 p. c. Ta_2O_5 , and possibly a little TiO_2 . He states further, that the low specific gravity supposed to be a specific character of this substance is explained by its containing less Ta_2O_5 (Brainerd's columbite contains 37 p. c.), and by the admixture of some foreign material. [As far as investigation has gone, hermannolite is not distinct from columbite.]

CONNELLITE, *Min.*, p. 627.—Optically uniaxial, positive, *Bertrand*, *Bull. Soc. Min.*, iv., 88, 1881.

COIAPITE, *Min.*, p. 655; *App. II.*, p. 13.—Optical characters, *Bertrand*, *Bull. Soc. Min.*, iv., 11; *Des Cloizeaux*, *ib.*, 41, 1881.

COPPER, *Min.*, p. 14; *App. II.*, p. 13.—*Cryst.*, v. *Kokscharof*, *Min. Russl.*, vi., 209, 1874, *Altai*, v. *Jeremejef*, *Verh. Min. Ges. St. Pet.*, II., xii., 281. Mine Friedrichsseggen, Nassau, *Seligmann*, *Verh. Nat. Ver. Rhein.*, xxxiii., 261, 1876. Lake Superior, *vom Rath*, *Z. Kryst.*, ii., 169, 1878; *Fletcher*, *Phil. Mag.*, V., ix., 180, 1880.

Pseudomorphs after aragonite, from Coro-Coro, Bolivia, described fully, *Domeyko*, 6th *App. Min. Chili*, p. 6, 1878.

COQUIMBITE, *Min.*, p. 650; *App. II.*, p. 13.—Copiapo, Coquimbo, Chili, revision of angles, c (vert.) = 1.5645, optical examination, *Arzruni*, with analyses by *Bamberger*, confirming *Rose's* results, *Z. Kryst.*, iii., 516, 1879.

CORDIERITE.—See *Iolite*, p. 63.

CORKITE.—*App. II.*, p. 13; see also *Beudantite*, p. 15.

CORNWALLITE.—*Min.*, p. 569; *App. II.*, p. 13.

Coronguite, *Raimondi*, *Minéraux du Pérou*, 1878, pp. 88, 91.

Amorphous, earthy, pulverulent, sometimes slightly lamellar. $H. = 2.5-3$. $G. = 5.05$. Color, exterior, grayish yellow; interior, blackish, with lustre slightly resinous. Intimately mixed with small quantities of sulphur, antimony, silver, and lead. An analysis, after the deduction of impurities, gave: Sb_2O_5 58.97, PbO 21.48, Ag_2O 7.82, FeO 0.52, H_2O 11.21 = 100; accordingly, an antimonate of lead and silver. Found at the mines of Mogollon, Huancavelica, and Empalme, in the district of Corongo, province Pallasca, and at Pasacancha, province of Pomabamba, Peru. [Of doubtful homogeneity.]

CORUNDOPHILITE, Min., p. 504; App. II., p. 13.—A mineral, apparently identical with corundophilite, is called AMESITE, by Shepard. Occurs with diaspore at Chester, Mass. Examined by Pisani (C. R., lxxxiii., 166, 1876). In hexagonal plates, foliated, resembling the green talc from the Tyrol. Uniaxial figure (positive), seen through cleavage fragment. H. = 2·5–3. G. = 2·71. Color apple green. Lustre pearly on cleavage face. Analysis:

SiO ₂	Al ₂ O ₃	Fe	MgO	H ₂ O	
21·40	32·30	15 80	19·90	10·90	= 100·30.

Q. Ratio for Si : [Al₂] : R : H = 9 : 12 : 10 : 8. B. B. nearly infusible.

CORUNDUM, Min., p. 137; App. II., p. 13.—Cryst., Ceylon, v. *Kokscharof*, Min. Russl., vi., 223, 1874. Tashkent, etc., v. *Jeremejef*, Verh. Min. Ges. St. Pet., II., xiii., 426, 440; xiv., 227 (Z. Kryst., ii., 504, 505; iii., 438; iv., 642).

Specific gravity determinations, *Church*, Geol. Mag., II., ii., 321, 1875.

Made artificially (rubies, sapphires), *Frémy* and *Feil*, C. R., lxxxv., 1029, 1877; *Meunier*, ib., xc., 701, 1880.

Occurrence of emery in Westchester Co., N. Y., *Kimball*, Am. Chem., iv., 9, 321, 1874; *J. D. Dana*, Am. J. Sc., III., xx., 200, 1880.

Mallard (Am. Min., VII., x., 150, 1876), describes crystals, in which a basal section consisted of six sectors; he assumes that the apparently rhombohedral crystals are really composed of three orthorhombic individuals. *Bertrand* (Bull. Soc. Min., i., 95, 1878), describes crystals from Siam (ruby) which are distinctly biaxial, with a widely varying axial angle from nearly 0° up to 58°. *Tschermak* (Min. Petr. Mitth., ii., 362, 1878), mentions crystals from Ceylon having a monoclinic symmetry in the distribution of the planes, and also optically biaxial. He concludes that many crystals are built up of monoclinic particles, occasionally so grouped as to give uniaxial effects in polarized light.

COSALITE, Min., p. 797; App. II., p. 13.—A mineral, apparently identical with cosalite, is called BJELKITE by *Sjögren* (Geol. Förr. Förh., iv., 106, 1878; ett nytt vismuthsvafadt svafelbly, *Lundström*, ib., ii., 178, 1874). Its characters are as follows: Massive, fibrous, radiated. H. = 2·5–3. G. = 6·39–6·75. Lustre metallic. Color steel gray. Streak grayish black. Composition Pb₂Bi₂S₈ = 2PbS + Bi₂S₃. Analyses: 1, *Lundström* (l. c.); 2, 3, *Sjögren* (l. c.).

	S	Bi	Pb	Fe	
1.	17 83	39·40	37·64	5·13	= 100, <i>Lundström</i> .
2.	15 98	41·55	40·10	0·67	insol. 2·19 = 100·49, <i>Sjögren</i> .
3.	16·48	41·86	39·19	1·32	= 98·85, <i>Sjögren</i> .

The material used in (1) was probably more or less impure through the presence of a little pyrrhotite. B. B. fuses easily, giving reactions for lead, bismuth, and sulphur; slowly attacked by HCl, dissolved in fuming nitric acid, with the separation of lead sulphate. From the Bjelke mine, in Nordmark, Wermland, Sweden.

Cossyrite, *H. Foerstner*, Z. Kryst., v., 348, 1881.

Triclinic, with $\alpha = 90^\circ 6'$, $\beta = 102^\circ 12'$, and $\gamma = 89^\circ 54'$, $I \wedge I' = 114^\circ 5'$. Form near that of amphibole, but differing in the prismatic zone. Cleavage *I* and *I'* distinct. Twins with the brachypinacoid as twinning plane. Crystals minute, 1·5 mm. long, and 0·5–0·6 mm. broad. G. = 3·74–3·75. Color black. Analysis:

SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	FeO	MnO	CuO	MgO	CaO	Na ₂ O	K ₂ O	
43·55	7·97	4·96	32·87	1·98	0·39	0·86	2·01	5 29	0·33	= 100·21.

Approaches in composition some ferruginous amphiboles. B. B. fuses easily to a brownish black glass. Partially decomposed by acids. Found imbedded in the liparite lavas of the island Pantellaria, whose ancient name was Cossyra. The crystals examined were weathered out of the ground mass.

Cotterite.—See Quartz, p. 101.

COTUNNITE, Min., p. 117; App. II, p. 13.—In semi-crystalline masses of a whitish color, with a tinge of yellow or green, with other lead minerals, Montagne de Challacallo, *Raimondi*, Min. Pérou, p. 172, 1878.

COVELLITE, Min., p. 83.—*Anal.*, New Annan, Nova Scotia, *Louis*, Trans. N. S. Inst., iv., 424, 1878.

CROCIDOLITE, Min., p. 243; App. II., p. 13.—An analysis by Dölter (Z. Kryst., iv., 40, 1879), afforded: SiO_2 52.11, Al_2O_3 1.01, Fe_2O_3 20.62, FeO 16.75, MgO 1.77, Na_2O [6.16], H_2O 1.58 = 100; locality South Africa. This confirms the ordinary belief as to its close relation to arfvedsonite (q. v., p. 9).

See also *Abriachanite*, p. 1.

CROCOITE, Min., p. 628.—*Cryst.*, v. *Kokscharof*, Min. Russl., vii., 97, 1877. Occurrence in Arizona, *Silliman*, Am. J. Sc., III., xxi., 203, 1881.

CRONSTEDTITE, Min., p. 503; App. II., p. 13.—*Cryst.*, Prizbram, etc., v. *Zepharovich*, Ber. Ak. Wien, lxxi., 276, 1875. In parallel position with pyrite crystals, *id.*, Lotos, 1880. *Anal.*, Prizbram. *Janovsky*, J. pr. Chem., II., xi., 378, 1875. Cornwall, *Field*, Phil. Mag., V., v., 52, 1878.

CRYOCONITE, App. II., p. 13.—Original material examined by v. *Lasaulx* proved to consist principally of quartz and mica, with also feldspar, hornblende, magnetite, garnet, and probably epidote and cyanite; metallic iron was not identified. The composition is near that of a gneiss, and v. *Lasaulx* concludes that the supposed cosmical dust of *Nordenskiöld* is in fact terrestrial, and probably came from the gneiss region of the coast of Greenland. Min. Petr. Mitth., iii., 521, 1881.

CRYOLITE, Min., p. 126; App. II., p. 14.—Greenland, monoclinic instead of triclinic, according to *Krenner*, J. Min., 1877, 504.

Artificial alteration products, *Nöllner*, ZS. G. Ges., xxxiii., 139, 1881.

Cryptohalite. A fluo-silicate of ammonium (NH_4F , SiF_2), whose probable existence with sal ammoniac in a Vesuvian fumarole is suggested by *Seacchi*, Att. Accad. Napoli, vi.; Contr. Min., ii., 37, 1874.

CRYPTOLITE, Min., p. 529.—In apatite from Arendal, *Fischer*, Z. Kryst., iv., 374, 1880. See also *Rhabdophane*.

CRYPTOMORPHITE, Min., p. 599; App. II., p. 14.—Relation to priceite, *How*, Min. Mag., i., 257, 1877.

CRYSTALLITES.—App. II., p. 14.

CUBANITE.—Min., p. 65; App. II., p. 14.

CULSAGEEITE.—App. II., p. 14 (30)

CUPRITE.—Min., p. 133; App. II., p. 14.

CUPROAPATITE.—App. II., p. 14.

Cuprocalcite. *Raimondi*, Domeyko, 5th Append., Min. Chili, 1876; Min. Pérou, p. 135, 1878. In small masses and in bands intimately mixed with a ferruginous calcite. H. = 3. G. = 3.90. Color bright vermilion red. Analysis gave: Cu_2O 50.45, CaO 20.16, CO_2 24.00, H_2O 3.20, Fe_2O_3 0.60, Al_2O_3 0.20, MgO 0.97, SiO_2 0.30 = 97.88. Formula deduced $(\text{Cu}_2\text{O})_2\text{CO}_2 + 2\text{CaCO}_3 + \text{H}_2\text{O}$. Soluble in hydrochloric acid with effervescence; the solution, formed out of contact with the air, has a strong deoxidizing power, precipitating gold from solutions of gold salts. From the mines of Canza, near the city of Ica,

Peru. [According to the results of Damour this is only an intimate mixture of calcium carbonate and copper oxide (Cu_2O), Bull. Soc. Min., i, 130, 1878.]

CUPROMAGNESITE.—App. II., p. 14.

CUPROSCHHEELITE.—Min., p. 606; App. II., p. 14.

CUPROTUNGSTITE.—App. II., p. 14.

CUPROVANADITE.—App. II., p. 15.



Cuspidine. *Scacchi*, Rend. Accad. Napoli, Oct., 1876; Z. Kryst., i, 398, 1877. Orthorhombic. In spear-shaped crystals, formed of two pyramids, 1 and $2-\frac{1}{3}$, with also $1-\bar{1}$ and $\bar{1}-\bar{1}$. $1 \wedge 1 = 112^\circ 8'$ and $77^\circ 50'$ terminal, and $146^\circ 30'$ basal. $1-\bar{1} \wedge 1-\bar{1} = 40^\circ 38'$. $b : b : a = 1.9376 : 1 : 0.7173$. Cleavage in one direction (basal). $H. = 5-6$. $G. = 2.853-2.860$. Color pale rose red. Contains SiO_2 , CaO , F , and CO_2 , the last probably from incipient alteration; composition stated to be perhaps Ca_2SiO_4 , with about one-third of the lime replaced by CaF_2 , but analysis not given. B. B. fusible with difficulty. Readily soluble in dilute acids. From Vesuvius. Named in allusion to the spear-shaped crystals. [A more complete chemical examination is to be desired.]

Vom Rath has described crystals of a mineral which resembled cuspidine, but which could not be positively identified with it (Ber. nied. Ges. Bonn, Feb. 7, 1881). He has since shown that this mineral is not cuspidine. He has also made a more exact determination of the form of the original cuspidine. It is monoclinic with c (vert) : $b : a = 1.9623 : 1 : 0.7247$, and $\beta = 90^\circ 55' 41''$. The crystals are twins, which *Scacchi* suggested might be the case. Ber. nied. Ges. Bonn, Nov. 7, 1881.

CYANITE, Min., p. 375; App. II., p. 14.—The hitherto imperfectly known crystalline form of cyanite has been fully described by *Bauer* (ZS. G. Ges., xxx., 283, 1878; xxxi., 244, 1879; xxxii., 717, 1880); and *vom Rath* (Z. Kryst., iii., 187, 1878; v., 17, 1880). See also *Mallard* (Bull. Soc. Min., ii., 9, 1879).

Made artificially, *Frémy* and *Feil*, C. R., lxxxv., 1032, 1877.

Pseudomorph from Pregratten, Tyrol, *Böhm*, Min. Petr. Mitth., ii., 522, 1879.

Anal., North Thompson R., British Columbia, *Hoffmann*, Geol. Canada, 1880.

CYMATOLITE.—See *Spodumene*, p. 112.

Cyprusite. *P. F. Reinsch*, Proc. Roy. Soc., xxxiii., 119, 1881. A supposed new iron sulphate, of very doubtful character. Occurs in large quantities, but in an impure condition, incrusting the surface of a hill in the western part of the island of Cyprus. Soft, chalk-like. Color yellowish; in powder intense sulphur yellow. $H. = 2$. $G. = 1.7$. Slightly soluble in water, soluble in boiling HCl , leaving a siliceous residue. An approximate analysis gave: SO_3 21.5, Fe_2O_3 (Al_2O_3 tr.) 51.5, insol. siliceous substance 25, H_2O (hygroscopic) 2 = 100. Contains a large percentage of well preserved siliceous shells of microscopic *Radiolaria*.

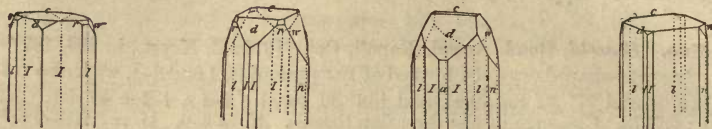
CYRTOLOTE. Min., p. 275.—A mineral regarded as related to cyrtolite by *Nordenskiöld* (Geol. Förh., iii., 229, 1876), has the following characters: In tetragonal crystals (1 and $\bar{1}-\bar{1}$), resembling dodecahedrons. Color yellow to yellowish brown. Translucent. $H. = 5.5-6$. $G. = 3.29$. Analysis: SiO_2 27.66, ZrO_2 (with a little Al_2O_3) 41.78, Er_2O_3 , Y_2O_3 8.49, Ce_2O_3 3.98, CaO 5.06, MgO 1.10, H_2O 12.07, FeO tr. = 100.14. Occurs with fergusonite, arrhenite, xenotime, at Ytterby, Sweden.

DAMOURITE.—See *Mica Group*, p. 77.

DANAITE.—See *Arsenopyrite*, p. 10; and App. II., p. 15.

DANALITE, Min., p. 265.—A mineral occurring in isometric octahedrons with magnetite and quartz, at the iron mine, Bartlett, N. H., is referred to danalite by *Wadsworth* (Proc. Bos. Soc. Nat. Hist., xx., 284, 1879). All the characters so far as observed agreed with that species, and the result of the blowpipe examination seems to set the matter above doubt.

DANBURITE, Min., p. 299.—From Russell, N. Y., described by *G. J. Brush* and *E. S. Dana* (Am. J. Sc., III., xx., 111, 1880; or *Z. Kryst.*, v., 188). The crystals belong to the orthorhombic system (not triclinic), and are closely homeomorphous with topaz; $I \wedge I = 123^\circ 52'$, $4-i \wedge 4-i = 54^\circ 58'$, $1-i \wedge 1-i = 97^\circ 7'$. Some of the common and simpler forms are shown in the adjoining figures. Here $l = i-2$, $n = i-4$, $d = 1-i$, $w = 4-i$, $r = 2-2$. The



optic axes lie in the basal plane, the bisectrix normal to the brachypinacoid is negative and is acute for red ($2V_\alpha = 87^\circ 37'$), but obtuse for blue ($2V_\beta = 90^\circ 56'$); $\beta = 1.634$ (Li). $H. = 7-7.25$. $G. = 2.986-3.021$. Color pale wine yellow, honey yellow to yellowish brown. Transparent. Lustre brilliant, vitreous to greasy (massive). Fracture uneven to subconchoidal. An analysis by Comstock gave:

	SiO ₂	B ₂ O ₃	CaO	Al ₂ O ₃ (Fe ₂ O ₃ tr.)	ign.
(3)	48.23	26.93	23.24	0.47	0.63 = 99.50.

Formula, same as that for the original mineral from Danbury, viz.: $\text{CaB}_2\text{Si}_2\text{O}_8 = \text{SiO}_2$ 48.78, B_2O_3 28.46, CaO 22.76 = 100. Occurs in small brilliant crystals imbedded in calcite, also in larger crystals in cavities from which the calcite has been weathered out, and massive. Associated minerals, quartz, calcite, mica, pyroxene, titanite.

The optical properties of the danburite from Danbury, Conn., have been examined by Des Cloizeaux (Bull. Soc. Min., iii., 195).

DATOLITE, Min., p. 380; App. II., p. 15.—**Cryst.**, Fossa della Castellina, near Porretta, Italy, *Bombicci*, Mem. Acc. Bologna, III., viii., 311, 1877 (*Z. Kryst.*, ii., 505). *Groth*, Min.-Samml. Strassburg, p. 186, 1878. Kuchelbad, near Prague, Bohemia, *Vrba*, *Z. Kryst.*, iv., 358, 1880; *Theiss*, Tyrol, ib., v., 425, 1881. Niederkirchen, Nahethal, *Lehmann*, *Z. Kryst.*, v., 529, 1881. *Andreasberg*, v. *Kokscharof*, Min. Russl., viii., 139, 1881.

Thermal and optical properties, *Bodewig*, Pogg. Ann., clviii., 230, 1876. Pyro-electrical properties, *Hankel*, Wied. Ann., vi., 57, 1879.

Anal., Casarza, Liguria, *Issel*, Boll. Com. Geol., 1879, 530. Kuchelbad, near Prague, Bohemia, *Preis*, *Z. Kryst.*, iv., 360, 1880. The datolite described by Smith (App. II., p. 16), as occurring with garnet and vesuvianite, was from San Carlos, Inyo Co., Cal. (Hanks), not from Santa Clara.

DAUBERITE.—App. II., p. 16.

Daubr elite. *J. L. Smith*, Am. J. Sc., III., xii., 109, 1876; xvi., 270, 1878.

Massive; somewhat scaly, structure crystalline. Cleavage in one direction. $G. = 5.01$. Lustre metallic, brilliant. Color black. Streak black. Brittle. Fracture uneven. Not magnetic. Composition (analogous to spinel group) $\text{FeS} + \text{Cr}_2\text{S}_3 = \text{FeS } 30.45, \text{Cr}_2\text{S}_3 \text{ } 69.55 = 100$. Analysis:

	S	Cr	Fe		
(3)	42.69	35.91	20.10	=	98.70, or,
	43.26	36.33	20.36	=	100.

B. B. infusible, loses lustre and (R. F.) becomes magnetic. With borax reacts for chro-

mium. Not attacked by cold nor by hot hydrochloric acid, but completely dissolved in nitric acid, without the liberation of free sulphur.

Occurs associated with troilite, on the borders of troilite nodules, or as minute veins running across them, in the meteoric irons, from Cohahuila, Mexico. Also identified in the iron of Toluca, Mexico, of Sevier, Tenn., and of Cranbourne, Australia. Named after M. Daubr e, of Paris.

The name schreibersite was given by Shepard to a supposed chromium sesquisulphide, occurring in the Bishopville meteorite (Am. J. Sc., II., ii., 383, 1846): the name was afterward changed by Haidinger to shepardite.

Daubreite. *I. Domeyko*, C. R., lxxxii., 922, 1876; Min. Chili, p. 297, 1879.

Amorphous; structure compact, earthy, in part fibrous. H. = 2-2.5. G. = 6.4-6.5. Color yellowish to grayish white. Opaque.

Composition—4 (Bi₂O₃) + Bi₂Cl₆ = Bi₂O₃ 76.16, Bi₂Cl₆ 23.84 = 100. Analysis, Domeyko (l. c.): Bi₂O₃ 89.60, Cl 7.50, H₂O 3.84 (?), Fe₂O₃ 0.72, or Bi₂O₃ 72.60, Bi₂Cl₆ 22.52, H₂O 3.84, Fe₂O₃ 0.72 = 99.68. In the closed tube gives off acid water, and becomes grayish in color; but on continued heating below fusion turns yellow again. B. B. colors the flame slightly blue; in very thin splinters fuses on the end instantly, the fused part becoming black and compact. Soluble in hydrochloric acid in the cold without residue, the solution having a more or less yellow color.

Occurs at the Constanca mine, Cerro de Tazna, Bolivia. Named after M. Daubr e, of Paris. Daubreite is related to the artificial compounds 2(Bi₂O₃) + Bi₂Cl and 6(Bi₂O₃) + Bi₂Cl₆.

Davreuxite. *De Koninck*, Bull. Ac. Roy. Belg., II., xlvi., 240, 1878.

Orthorhombic (on optical grounds). Resembles asbestos. In aggregates of slender transparent acicular crystals, light extinction parallel and perpendicular to longitudinal direction. Cleavage transverse to needles(?). Color white, with a tinge of flesh red. Analysis of material free from impurity, except quartz:

	SiO ₂	Al ₂ O ₃	MnO	MgO	H ₂ O	
(3)	55.94	33.59	5.25	1.10	4.19	Fe ₂ O ₃ or FeO tr. = 100.07.

The amount of quartz was determined as from 13 to 18 p. c.; in the above analysis 16.63 p. c.; and the remainder corresponds approximately to the formula H₁(Mn, Mg)[Al₁₂]₃Si₆O₂₄, which requires: SiO₂ 46.89, Al₂O₃ 40.19, MnO 6.93, MgO 1.30, H₂O 4.69 = 100. B. B. infusible; with soda a manganese reaction; with cobalt solution a blue color. Slightly attacked by acids. Occurs in quartz veins in the Ardennes schists, at Ottr , Belgium. Named after M. Ch. Davreux.

DAVYNE, Min., p. 328.—Relation to cancrinite and microsommite, *Rauff*, Z. Kryst., ii., 478, 1878.

DAWSONITE, App. II., p. 16.—Optical examination, *Des Cloizeaux*, Bull. Soc. Min., i., 8, 1878.

Occurs in the province of Siena, Pian Castagnaio, Tuscany, according to *Chaper* (Bull. Soc. Min., iv., 155, 1881). Found in thin plates, radiated, and formed of fine fibres in a quartzose rock, impregnated with dolomite, in part argillaceous; associated with calcite, dolomite, pyrite, fluorite, and cinnabar. An analysis by Friedel (ib., iv., 28) afforded: (3) CO₂ 29.09, Al₂O₃ 35.89, Na₂O 19.13, H₂O 12.00, MgO 1.39, CaO 0.42; formula Na₂[Al₂]C₂O₆, 2H₂O or 3Na₂CO₃ + Al₂C₂O₆ + 2[Al₂]H₂O₆, which requires: CO₂ 30.4, Al₂O₃ 35.6, Na₂O 21.5, H₂O 12.5 = 100.

Recently found at the Montreal reservoir, Canada, *Harrington* (Can. Nat., x., 1881). Analysis, after deducting impurities, principally calcite: CO₂ 27.78, Al₂O₃ 36.12, Na₂O 22.86, H₂O 13.24 = 100.

DECHENITE.—Min., p. 609; App. II., p. 16.

DELAFOSSITE.—App. II., p. 16.

DELESSITE, Min., p. 497; App. II., p. 16.—Analyses of several related minerals, Scotland, *Heddle*, Trans. Soc. Edinb., xxix., 81, 1879.

A blackish green chloritic mineral, filling cavities in eruptive rocks in the Thüringer Wald, gave Pufahl (G. = 2·836):

SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	K ₂ O	Na ₂ O	P ₂ O ₅	SO ₃	CO ₂	H ₂ O
28·79	0·18	16·74	4·83	18·30	0·31	16·62	0·98	0·28	0·24	0·08	0·26	0·35	12·25 = 100·21.

For this the formula is calculated R, [R₂]₂Si₃O₂₃ + 7 aq. Weiss proposes the name SUB-DELESSITE for varieties of delessite which show but little Fe₂O₃, and much FeO. ZS. G. Ges., xxxi., 801, 1879.

See also *Diabantite*, p. 37; *Hullite*, p. 60, etc.

DELVAUXITE, Min., p. 583.—Ausstrich, Bohemia, occurrence and composition, *Vala* and *Helmhacker*, J. Min., 1875, 317. Visé, Belgium, *Jorissen* finds 0·30 As₂O₃ and 0·10 V₂O₅, and deduces the formula [Fe₂]₃P₄O₂₅, 15H₂O, or if the water lost by desiccation at ordinary temperatures is included, the same with 11aq additional. Mem. Soc. Geol. Belg., vi., 38, 1879.

DERNBACHITE, App. II., p. 16.—See *Beudantite*, p. 15.

DESCLOIZITE, Min., p. 609; App. II., p. 16.—Cryst. description, probably monoclinic, Venus mine, Department de Minas, and other localities in the Sierra de Cordoba, Argentine Republic, *Websky*, Z. Kryst., v., 542, 1881 (Ber. Ak. Berlin, 1880, 672).

Analyses, Cordoba: 1, dark brown crystals, Rammelsberg; 2, Döring:

	V ₂ O ₅	As ₂ O ₃	PbO	ZnO	FeO	MnO	CuO	H ₂ O	Cl
1. G. = 6·080 (3)	22·74	...	56·48	16·60	...	1·16	...	2·34	0·24 = 99·56.
2.	(3) 21·41	0·27	56·20	17·03	0·97	0·58	0·23	2·35	0·26 insol. 0·47 = 99·82.

In light brown crystals (G. = 5·915) Rammelsberg obtained PbO 54·35, ZnO 20·93. These analyses lead to the formula R₄V₂O₈, H₂O or R₃V₂O₈ + RH₂O₂ (Ber. Ak. Berlin, 1880, 652; and ZS. G. Ges., xxxii., 709, 1880). This formula is analogous to that of libethenite, the form of which, as shown by Des Cloizeaux, is also near that of descloizite. On the other hand, Rammelsberg shows that the analysis of Damour (Min., p. 609) after the deduction of the soluble portion reduces to V₂O₅ 24·80, PbO 60·40, ZnO 2·25, FeO 1·48, MnO 5·87, CuO 0·99, H₂O 2·43, Cl 0·35 = 98·57, and this corresponds to R₃V₂O₈, H₂O, with R = (Mn, Zn, Fe, Cu) : Pb = 1 : 2. Rammelsberg throws some doubt over the correctness of Damour's analysis.

Probable occurrence of descloizite in Arizona, *Silliman*, Am. J. Sc., III., xxii., 201, 1881.

A vanadate, related to descloizite, has been called BRACKEBUSCHITE by Döring (Rammelsberg, ZS. G. Ges., xxxii., 711, 1880). The description is as follows:

Occurs in small striated prismatic crystals. Color black. An analysis gave Döring, after the deduction of 4·36 p. c. insoluble: V₂O₅ 25·32, P₂O₅ 0·18, PbO 61·00, FeO 4·65, MnO 4·77, ZnO 1·29, CuO 0·42, H₂O 2·03 = 99·66. Rammelsberg deduces the formula R₃V₂O₈ + H₂O, with Fe : Mn : Pb = 1 : 1 : 4, this gives: V₂O₅ 25·45, PbO 62·09, FeO 5·01, MnO 4·95, H₂O 2·50 = 100. Occurs with descloizite and vanadinite, at several localities in the State of Cordoba, Argentine Republic. Named for Dr. D. Luis Brackebusch, of Buenos Ayres. [It is of interest, that the analysis of Döring of this mineral, and that of Damour (as recalculated by Rammelsberg) on the supposed original descloizite, give very nearly identical results; the relation of the two minerals is still uncertain.]

Destinezite. *Forir* and *Jorissen*, Bull. Soc. Geol. Belg., vii., 117, 1881. Announced as an iron phosphate, near delvauxite, containing, according to *Jorissen*, P₂O₅, As₂O₃, V₂O₅, Fe₂O₃, Al₂O₃, CaO, MgO (tr.), CuO (tr.). Dissolves in hydrochloric acid leaving a slight residue of impurities. Occurs in yellowish white nodular masses of an earthy aspect on the surface, but dull on the fracture. From the ampelite at Argenteau, Belgium. Named after M. Destinez. A complete description is promised.

DEWALQUITE.—App. II., p. 16 (4).

Diabantite. *G. W. Hawes*, *Am. J. Sc.*, III., ix., 454, 1875. **DIABANTACHRONNYN**, *Liebe*, *Jahrb. Min.*, 1870 (Appendix I., p. 4).

Massive, with a foliated radiated structure. $H. = 1$. $G. = 2.79$. Color dark green. Strongly dichroic. Analyses by *Hawes* (l. c.), on separate samples, each proved by the microscope to be homogeneous :

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	H ₂ O	
1. ($\frac{3}{2}$)	33.24	11.07	2.26	25.11	0.41	16.51	1.11	0.25	9.91	= 99.87.
2. ($\frac{2}{2}$)	33.68	10.84	2.86	24.33	0.38	16.52	0.73	0.33	10.02	= 99.69.

These analyses give a quantivalent ratio of $R : [R_2] : Si : H = 4 : 2 : 6 : 3$, or that of a unisilicate. This corresponds to the formula $R_{12}[R_2]_2Si_6O_{36} + 9aq$, which is near to that of pyrosclerite. Occurs filling amygdaloidal cavities in the trap of the Farmington Hills, Conn.

The above mineral is similar to the diabantachronnyne of *Liebe*, in mode of occurrence and in composition ; *Hawes* suggests the name diabantite as a substitute for the earlier name. It is also very near to *Wiik's euralite* (App. I., p. 6). These and several other similar minerals, *epichlorite*, *hullite*, etc., may fairly be classed with *delessite*, *Min.*, p. 497.

DIADOCHITE, *Min.*, p. 588.—**Anal.**, *Psychagnard*, *Isère, Carnot*, *Bull. Soc. Min.*, iii., 39, 1880 ; *Védrin*, *Belgium*, *Bull. Soc. Geol. Belg.*, vii., 114, 1881.

DIALLAG.—See *Pyroxene*, p. 100.

DIALOGITE.—See *Rhodochrosite*, p. 103.

DIAMOND, *Min.*, p. 21 ; App. II., p. 16.—**Cryst.**, *Rose-Sadebeck*, *Abh. Akad. Berlin*, 1876, 85 (*Z. Kryst.*, ii., 93, 1877), and *ZS. G. Ges.*, xxx., 605, 1878. *Hirschwald*, *Z. Kryst.*, i., 212, 1877. *Groth*, *Min.-Samml. Strassburg*, p. 4, 1878. *Baumhauer*, *Wied. Ann.*, i., 462, 1877. *Martin*, *ZS. G. Ges.*, xxx., 521, 1878.

Striations on black diamond (carbonado), due to friction, *Daubrée*, *C. R.*, lxxxiv., 1277, 1877.

Anomalous optical characters explained, *Jannettaz*, *Bull. Soc. Min.*, ii., 124, 1879.

Occurrence in South Africa, *E. J. Dunn*, *Q. J. Geol. Soc.*, xxxiii., 879, 1877 ; xxxvii., 609, 1881 ; *Chapet*, *Bull. Soc. Min.*, ii., 195, 1879 ; *Friedel*, *ib.*, ii., 197 ; *Fouqué* and *Lévy*, *ii.*, 216 ; *iii.*, 189 ; *J. A. Roorda Smit*, *Arch. Néerland*, xv., 61, 1880 ; *A. Sjögren*, *Geol. Föhr.*, vi., 10, 1882. In South America, *Gorceix*, *Bull. Soc. Min.*, iii., 36, 1880 ; and *C.R.*, xciii., 98, 1881.

Made artificially, *J. B. Hannay*, *Proc. Roy. Soc.*, xxx., 188, 450, 1880.

DIAPHORITE.—App. I., p. 4 ; see also *Freieslebenite*, p. 48.

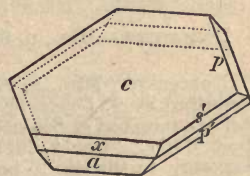
DIASPORE.—*Min.*, p. 168 ; App. II., p. 17.

Dickinsonite. *G. J. Brush* and *E. S. Dana*, *Am. J. Sc.*, III., xvi., 114, 1878.

Monoclinic ; pseudo-rhombohedral. Axes, $b : a : c = 0.6917 : 0.5773 : 1$; $\beta = 61^\circ 30'$. Observed planes (see figure) : $O(c)$, $i-i(b)$, $i-i(a)$, $1(p)$, $2(s) - 3-i(x)$. $I \wedge I = 66^\circ 36'$, $c \wedge a = 118^\circ 30'$, $c \wedge x = 137^\circ 30'$, $c \wedge p = 118^\circ 52'$, $c \wedge s = 97^\circ 58'$. Crystals rare, tabular in habit, with triangular striations on basal plane ; commonly foliated to micaceous. Massive ; also curved lamellar, radiated or stellated. Cleavage : basal perfect.

$H. = 3.5-4$. $G. = 3.338-3.343$. Lustre vitreous, on cleavage face somewhat pearly. Color olive to oil green, in masses dark grass green. Streak nearly white. Transparent to translucent. Fracture uneven. Brittle. Planes of light-vibration parallel (grass-green) and normal (yellow-green) to edge c/α in basal section.

Composition : $4R_2P_2O_8 + 3aq$. If $R = Mn : Fe : Ca : Na_2 = 5 : 2\frac{1}{2} : 3 : 1\frac{1}{2}$, percentage composition : P_2O_5 40.05, FeO 12.69, MnO 25.04, CaO 11.85, Na_2O 6.56, H_2O 3.81 = 100.



Analyses : 1, 2, by S. L. Penfield ; 1, after deduction of impurities, viz., 3·30 p. c. quartz, and 6·89 p. c. eosphorite ; 2, after deducting 1·89 p. c. quartz, 6·89 p. c. eosphorite.

	P ₂ O ₅	FeO	MnO	CaO	Li ₂ O	Na ₂ O	K ₂ O	H ₂ O
1.	39·36	12·40	25·10	13·36	0·03	5·25	0·89	3·86 = 100·25.
2.	39·53	11·90	23·96	[14·98]	0·24	4·78	0·73	3·88 = 100·00.

In the closed tube gives water, the first portions of which are neutral, but the last portions react faintly acid; the residue is magnetic. Fuses in the naked lamp-flame, and B. B. in the forceps colors the flame at first green then greenish yellow; reacts for iron and manganese with the fluxes. Soluble in acid.

Occurs at Branchville, Fairfield Co., Conn., intimately associated with eosphorite, triploidite, and other species in nests in a vein of albitic granite. Often disseminated in minute plates through massive eosphorite, giving it a green color; similarly imbedded in lithiophilite. Named after Rev. Wm. Dickinson, formerly of Redding.

Dietrichite. V. *Schröckinger*, Verh. G. Reichs., 1878, 189. *Arzruni*, Z. Kryst., vi., 92, 1881. In fine fibrous, tufted forms, as an efflorescence or incrusting. Monoclinic (?), *Arzruni*. H. = 2. Lustre silky. Color dirty white to brownish yellow. Easily soluble in water; taste like vitriol. B. B. fusible. Composition (Zn, Fe, Mn) SO₄ + Al₂S₃O₁₂ + 22aq. Analysis by Dietrich:

SO ₃	Al ₂ O ₃	ZnO	FeO	MnO	MgO	H ₂ O
35·94	10·92	3·70	3·11	1·74	0·33	44·38 = 100·12.

A recent formation (within 14 years) in an abandoned working at Felsöbanya, Transylvania. [Belongs with the related alums, mendozite, bosjemanite, halctrichite, etc.]

DIOPSIDE.—See *Pyroxene*, p. 100.

DIMORPHITE.—Min., p. 28; App. II., p. 17.

DIOPTASE, Min., p. 401; App. II., p. 17.—*Cryst.*, v. *Kokscharof*, Min. Russl., vi., 285, 1875; vii., 218, 1878. *Chili, vom Rath*, Z. Kryst., v., 257, 1880; *Bauer*, ZS. G. Ges. xxxii., 714, 1880. [Bauer states that the reported occurrence of dioptase in Nassau is a mistake, see Syst. Min., p. 402; Text-Book, p. 279.]

DOLEROPHANITE.—App. II., p. 17.

DOLOMITE, Min., p. 68; App. II., p. 17.—*Cryst.*, Bex, Switzerland, v. *Kokscharof*, Min. Russl., vii., 1, 1875; Bull. Ac. St. Pet., xxi., 47, 1875. Binnenthal, etc., *Groth*, Min.-Samm. Strassburg, p. 127, 1878.

Relation to the other rhombohedral carbonates discussed, *Tschermak*, Min. Petr. Mitth., iv., 99, 1881.

Anal., Bleiberg, Carinthia, von *Zepharovich*, Z. Kryst., iii., 100. *Anal.* of var. *miemite* (by John), from Zepce, Bosnia, *F. v. Hauer*, Verh. G. Reichs., 1879, 121.

Origin of dolomite discussed, *Doelter* and *Hoernes*, Jahrb. G. Reichs., xxv., 293, 1875; *Hoppe-Seyler*, ZS. G. Ges., xxvii., 495, 1875.

DOMYKITE.—Min., p. 36; App. II., p. 17.

DOPPLERITE, Min., p. 749.—A black gelatinous hydrocarbon, related to dopplerite, is described by *T. Cooper* (Eng. Min. Journ., Aug. 13, 1881), as found in a stratum of muck below a peat bed, at Scranton, Penn. More particularly described by *H. C. Lewis* (Am. Phil. Soc. Philad., Dec. 2, 1881). When first found it was jelly-like in consistency, but on exposure to the air it becomes tougher and is elastic, somewhat like india-rubber, and finally when quite dry it is brittle and nearly as hard as coal. Only partially dissolved in hot alcohol, but completely in caustic potash. When dry burns with a yellow flame. Analysis by *J. M. Stinson*, of material dried at 100° C., gave: C 28·99, H 5·17, N 2·46, O 56·98, ash 6·40 = 100; for which the empirical formula C₁₆H₂₂O₁₆ is calculated. *Lewis*

suggests that the various allied jelly-like hydrocarbons may be grouped together under the name PHYTOCOLLITE (*φυτόν, κόλλα, or plant jelly*), but the new name is hardly needed.

DUDLEYITE.—App. II., p. 18.

DUFRENITE, Min., 583; App. II., p. 18.—Anal., Dept. of Freirina, Atacama, *Domeyko*, Min. Chili, 3d ed., p. 161, 1879. From the Rothläufchen mine, near Waldgirmes (kraurite), *Streng*, J. Min., 1881, i., 110.

In radiated coarsely fibrous masses of a dark greenish-brown color, forming an irregular bed of about 10 inches in depth, underlying limonite, in Rockbridge Co., Va.; anal. by J. L. Campbell: P₂O₅ 31·76, Fe₂O₃ 50·85, Al₂O₃ 0·21, FeO 6·14, MnO 0·40, CaO 1·12, MgO 0·76, H₂O 8·53, insol. 0·12 = 99·89. Am. J. Sc., III., xxii., 65, 1881. The same occurrence was earlier analyzed by *Massie* (Ch. News, xlii., 24, 181, 1880), and with almost identical results.

DUFRENOYSITE.—Min., p. 92; App. II., p. 18.

Dumortierite. *Gonnard*, Bull. Soc. Min., iv., 2, 1881; *Bertrand*, ib., iii., 171; and iv., 9; *Damour*, ib., iv., 6.

Orthorhombic (on optical grounds). Occurs in minute prismatic crystals, always twins, prismatic angle inferred to be about 120°. Biaxial, negative bisectrix parallel to the longitudinal direction of the crystals, axial angle small, dispersion $\rho < \nu$. Remarkably dichroic; colorless when the crystals are parallel, and deep cobalt blue when perpendicular to the plane of polarization. The phenomenon of *houppes* observed in fragments of ·01 mm. thickness, even more strikingly than in andalusite (*Bertrand*). G. = 3·36 (see below). Color light blue. Analysis, *Damour*:

SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	ign
29·85	66·02	1·01	0·45	2·25 = 99·58.

Calculated formula [Al₂]₂Si₂O₁₁, which requires: SiO₂ 30·40, Al₂O₃ 69·60. [The material analyzed was obtained by attacking the granite in which it occurred with a mixture of HF and H₂SO₄. This mineral was then separated from the quartz and other substances undecomposed by the Thoulet liquid. Necessarily, therefore, more or less doubt surrounds the chemical composition; the loss by ignition is also neglected in the formula.] *Damour* thinks the blue color may be due to blue oxide of titanium. B. B. infusible, loses color on strong ignition; with cobalt solution a beautiful blue, characteristic of aluminum. With salt of phosphorus gives a slightly bluish opaline bead.

Found in fibrous forms imbedded in feldspar in blocks of gneiss at Chaponost, near Lyons, France, original locality probably Beaunan. Named for the paleontologist M. Eugène Dumortier.

Duporthite, *J. H. Collins*, Min. Mag., i., 226, 1877.

In fibrous masses occupying fissures in serpentine. H. = 2. G. = 2·78. Lustre silky. Color greenish to brownish gray. Flexible in thin fibres like asbestos. Analysis gave: SiO₂ 49·21, Al₂O₃ 27·26, FeO 6·20, MgO 11·14, CaO 0·39, Na₂O 0·49, H₂O 3·90, do. hygroscopic 0·63 = 99·27. About half the water goes off only at an elevated temperature. A relation to neolite (Min., p. 406), is suggested. From Duporth, near St. Austell, Cornwall. [Needs further examination.]

DURANGITE, App. I., p. 4.—Des Cloizeaux has investigated the crystalline form and optical properties (Ann. Ch. Phys., V., iv., 401, 1875). An analysis by G. W. Hawes (*Brush*, Am. J. Sc., III., xi., 464, 1876), of small dark-colored crystals (G. = 4·07, other light-colored crystals gave G. = 3·937), afforded:

As ₂ O ₃	Al ₂ O ₃	Fe ₂ O ₃	Mn ₂ O ₃	Na ₂ O	Li ₂ O	F
53·11	17·19	9·23	2·08	13·06	0·65	7·67* = 102·99, deduct 3·23 O corresponding to F = 99·76.

* A second determination gave F = 7·49.

This gives the atomic ratio $R : [R_2] : As = 2 : 1 : 2$; the ratio of $O : F = 4.7 : 1$. The formula may be written $R_2 [R_2] As_2 (O, F)_6$, or nearly $[R_2] As_2 O_8 + 2RF$; which is analogous, as remarked by Brush (l. c.), to amblygonite, to which, however, in form and optical characters it has apparently no relation (Des Cl.).

Durangite is described by H. G. Hanks (Am. J. Sc., III., xii., 274, 1876), as occurring at the Barranca tin mine, eighteen miles north-east of Coneto, State of Durango, and about ninety miles north-east of the city of Durango. The mineral is found not with the stream tin, but in a vein four to six inches in thickness; the crystals are sometimes attached to the walls of the vein (here the large, light, orange-colored variety, App. I., p. 4), sometimes with cassiterite in the white pulverulent matter which fills the veins (small, dark-colored variety, see above). The largest crystal found was 19 mm. long, 11 mm. thick, and weighed 3.022 grams.

Dürfeldtite. *Raimondi*, Minéraux du Pérou, p. 125, 1878.

In masses with indistinct fibrous structure, also in fine needles. $H. = 2.5$. $G. = 5.40$. Color light gray. Lustre metallic. Associated with quartz as gangue. After deduction of impurities (31.31 p. c. gangue), the composition is:

S	Sb	Pb	Ag	Cu	Fe	Mn
24.15	20.52	25.81	7.34	1.86	2.24	8.06 = 100.

For this the formula $3RS + Sb_2S_3$ is deduced. B. B. on charcoal gives off antimonial fumes, gives a lead coating, and leaves a globule rich in silver. With borax reacts for manganese. From the Irisnachay mine, Anquimarea, province Cajatambo, Peru. Named after M. R. Dürfeldt. [This mineral is very near styolypite, but differs in containing lead instead of copper. An analysis of the pure mineral is to be desired.]

Duxite. *Dölter*, Verh. G. Reichs., 1874, 145. A resin from the lignite of Dux, Bohemia. Opaque. Color dark brown. $G. = 1.133$. Melts at 246° . Fischer obtained besides 2.72 water and 1.94 ash: C 78.25, H 8.14, O 13.19, S 0.42 = 100. Near walchovite, Min., p. 741.

Dysanalyte. *A. Knop*, Z. Kryst., i., 284, 1877. PEROFSKITE of former writers.

Isometric; in cubes. Cleavage cubic. $G. = 4.13$. Color black. Analyses: 1, 2, Seneca (Ann. Chem. Pharm., civ., 371, 1856); 3, Knop; 4, same as 3 after deduction of impurities:

TiO ₂	Cb ₂ O ₆	FeO	MnO	CeO	CaO	Na ₂ O
1. 58.95	.....	6.23	.....	.....	35.69	..... = 100.87.
2. 59.30	.....	5.99	.....	.....	35.94	..... = 101.23.
3. 40.57	22.73	5.70	0.42	5.58	19.36	3.50 SiO ₂ , 2.31, MgO, K ₂ O, Al ₂ O ₃ , F, tr. = 100.17.
4. 41.47	23.23	5.81	0.43	5.72	19.77	3.57 = 100.

The atomic ratio for $R : Cb : Ti : O = 7 : 2 : 6 : 24$, corresponding approximately to the formula $RCb_2O_6 + 6RTiO_2$. Found in the granular limestone of Vogtsburg, Kaisers-tuhlgebirge, Baden. The mineral has previously been called perofskite, but is in fact closely related to pyrochlore (Min., p. 512), and koppite (App. II., p. 32). Named, in allusion to the difficulty of the analysis, from *δυσανάλυτος*, hard to undo.

DYSCRASITE.—Min., p. 35; App. I., p. 5.

DYSDOLE, Min., p. 746.—Anal., Church, Ch. News, xxxiv., 155, 1876.

Eggonite. *Schrauf*, Z. Kryst., iii., 352, 1879.

Triclinic. In minute ($\frac{1}{4}$ to 1 mm.) crystals resembling common forms of barite (Min., p. 616, figs. 505 E, F), hence orthorhombic in habit. Closely related in angle to hopeite (Min., p. 544, see also this Appendix, p. 59). $H. = 4-5$. Color light grayish brown. Streak white. Lustre sub-adamantine. Translucent to transparent. B. B. infusible, becomes gray and opaque. On charcoal with soda a cadmium coating (no zinc observed). With salt of phosphorus a colorless bead enclosing a skeleton of silica. Insoluble in HCl or HNO₃. Regarded as essentially a silicate of cadmium.

Occurs on and implanted in crystallized calamine, which in turn fills cavities in smith-

sonite; the last mineral is massive, coarse granular, and of a light brown color, and mixed more or less with red clay. The eggonite is so called from *εγγονος*, *grandson*, as being the third generation in the series of zinc-cadmium compounds. From Altenberg. [Needs further examination.]

EHLITE.—See *Pseudomalachite*, p. 97.

Eisenbrucit.—See *Brucite*, p. 18.

Ekdemite. *Nordenskiöld*, Geol. För. Förh., iii., 379, 1877.

Tetragonal (?). Massive, coarsely granular: also as a crystalline incrustation. Cleavage: basal, nearly perfect. Optically uniaxial. $H. = 2.5-3$. $G. = 7.14$. Lustre on cleavage plane vitreous, on fracture surfaces greasy. Color bright yellow to green. Translucent in thin splinters. Brittle. Composition: $Pb_3As_2O_8 + 2PbCl_2 = As_2O_3, 10.59, PbO 59.67, Cl 7.58, Pb 22.16 = 100$. Analysis (l. c.):

As ₂ O ₃	PbO	Cl	Pb
10.60	58.25	8.00	23.39 = 100.24.

Fuses easily to a yellow mass, with the loss of lead chloride as a white sublimate; gives a lead coating on charcoal. Soluble readily in nitric or warm hydrochloric acid.

Found at Långban, Wermland, Sweden, in small granular masses, imbedded in a yellow manganesian calcite; also as an incrustation. Named from *εκδημιος*, *unusual*.

A mineral of similar appearance, also a compound of arsenic, lead, and chlorine, having the same pyrognostic characters, occurs at Långban, as small lemon yellow grains in calcite. Held to be orthorhombic on basis of crystalline form and optical character. $O \wedge 1 = 114^\circ 36'$, $1 \wedge 1 = 101^\circ 28'$; but as Groth shows (*Z. Kryst.*, ii., 307), these angles give a ratio $1 : .967$ for the lateral axes, so that it may be identical with ekdemite, and not as Nordenskiöld suggests, a dimorphous form.

ELÆOLITE.—See *Nephelite*, p. 84; and App. II., p. 18.

Eleonorite.—See *Beraunite*, p. 13.

Elroquite. *C. U. Shepard*, *Min. Contr.*, 1877.—An apple green to gray, massive substance; translucent to nearly opaque. $H. = 6$. $G. = 2.35-2.40$. Composition: $SiO_2, 16.4, Al_2O_3, 16.4, Fe_2O_3, 13.8, H_2O, 21.8 [P_2O_5, 32.00 \text{ by difference}] = 100$. Regarded as a hydrosilicate of Al_2O_3 and Fe_2O_3 , mixed with opaline silica and a supposed chromium phosphate, to which "the green color was found to be due." To the chromium phosphate the name PHOSPHOCHROMITE is given [see App. I., p. 9]. From the Island of Elroque, Caribbean Sea. [The description of the mixture is so incomplete that the existence of the supposed species cannot be regarded as proved.]

EMBOLITE, *Min.*, p. 115; App. II., p. 18.—A mineral from the silver mines in the Troitzker Bezirk, Orenburg, gave *W. von Beck* (*J. Min.*, 1876, 165): $Br 28.44, Cl 8.21, Ag 63.35 = 100$, or $AgBr 66.83, AgCl 33.17 = 100$, which corresponds to $3AgBr + 2AgCl$. It occurs in minute octahedral crystals, and in thin crusts.

EMERALD.—See *Beryl*, p. 13.

EMPLECTITE, *Min.*, p. 86; App. II., p. 18.—*Anal.*, Aandal, Thelemarken, Norway, *Daw*, *Ch. News*, xl., 225, 1879.

ENARGITE, *Min.*, p. 107; App. II., p. 18.—*Cryst.*, Matzenköpfl, near Brixlegg, Tyrol, *von Zepharovich*, *Z. Kryst.*, iii., 600, 1879. In compound crystals, twins and star-shaped threelings, twinning plane $i-\frac{3}{2}$, Argentine Republic, *von Rath*, *Z. Kryst.*, iv., 426. Also from Mancayan, Luzon, twins, etc., *Zettler* (Klein), *J. Min.*, 1880, i., 159 (ref.).

Anal., quoted by Brackebusch, *Min. Repub. Argentina*, 49, 1879.

Occurrence in Mexico, *Burkhardt*, *Naturaleza*, iii., 336, 1875.

See also *Clarite*, p. 27, *Famatinite*, p. 45.

ENSTATITE, Min., p. 208; App. II., p. 18.—Cryst., Kjørrestad, near Bamle, Norway, in enormous crystals, with analyses, *Brögger* and *von Rath*, Z. Kryst., i., 18, 1877. Gröditzberg, near Liegnitz, Silesia, cryst. and optical exam., *v. Lasaulx*, J. Min., 1878, 673. Snarum, pseudomorphous crystals, *Seligmann*, Z. Kryst., iii., 81, 1878. Anal., Georgia, *König*, Proc. Acad. Nat. Sc. Philad., 1877, 198.

Enysite, *Collins*, Min. Mag., i., 14, 1876; *C. Le Neve Foster*, *ibid.*, p. 9.

Forms a bluish green stalagmitic crust. H. = 2-2.5. G. = 1.59. An analysis gave: SO₃ 8.12, Al₂O₃ 29.85, CuO 16.91, CaO 1.35, SiO₂ 3.40, CO₂ 1.05, H₂O (over H₂SO₄ after 3 days) 14.04, at 150° C. 18.21, at a red heat 7.17, Fe₂O₃, Cl, Na₂O tr. = 100.10. Compare analyses by *Flight* (J. Ch. Soc., Jan., 1871) and *Pisani* (Phil. Mag., Ap., 1868).

Found at St. Agnes, Cornwall, in one of the caves at the old quay. Named after J. S. Enys, F. G. S. [A most improbable compound. Groth shows that it is to be regarded as merely a mechanical mixture (Z. Kryst., i., 75).]

EOSITE.—App. I., p. 5.

Eosphorite.—See *Childrenite*, p. 24.

EPIBOULANGERITE.—App. I., p. 5.

EPIDOTE, Min., p. 281; App. II., p. 18.—Cryst., *v. Kokscharof*, Min. Russl., vi., 297, 1874. Heponsekä, Finland, *Wiik*, Gfv. Finsk. Vet. Soc., xix., 69, 1876-7. Optical exam., *Fouqué-Lévy*, Ann. Min., VII., xii., 434, 1877. *Groth*, Min. Samml., Strassburg, p. 195, 1878. Cryst. monograph, description of crystals from many localities, with a large number of new forms, and a catalogue of all occurring planes, *Bücking*, Z. Kryst., ii., 321, 1878. Cryst. monograph, giving many measurements, and the constants deduced from them, *N. von Kokscharof, Jr.*, St. Petersburg, 1879 (Min. Russl., viii., 43, 1881).

Photometric measurements of light absorption, *Pulfrich*, Z. Kryst., vi., 157, 1881.

Anal., Allochenthal, Tyrol, *Dölter*, Min. Mitth., 1875, 175. Syra, *Lüdecke*, ZS. G. Ges., xxviii., 262, 1876. Quenast, Belgium, *Renard*, Bull. Ac. Belg. II., l., 170, 1880. Amelia Co., Va., *Lippit*, Ch. News, xliii., 208, 1881. Analyses of varieties occurring crystallized together in parallel position, Zöptau, Silesia, *Bauer*, J. Min., 1880, ii., 78. Analyses and discussion of composition of the species of the epidote group, *Laspeyres*, Z. Kryst., iii., 525, 1879. The doubts suggested by *Laspeyres* in regard to the correctness of the accepted formula H₂Ca₄[Al₂]₃Si₆O₂₆ are answered by *Tschermak* and *Sipöcz*, Ber. Ak. Wien, lxxxii., 141, 1880, and still further by *Ludwig*, Min. Petr. Mitth., iv., 153, 1881.

EPIGENITE.—App. I., p. 5.

EPIPHANITE.—App. I., p. 6.

EPISTILBITE, Min., p. 443; App. II., p. 19.—*Des Cloizeaux* finds epistilbite to be monoclinic in optical characters (Bull. Soc. Min., ii., 161, 1879). A similar result is reached by *Tenne* (J. Min., 1879, 840; 1880, i., 43), who discusses fully the crystalline form. He also quotes an analysis by *Jannasch*, SiO₂ 58.55, Al₂O₃ 17.15, CaO 8.99, H₂O 15.41 = 100.10, which corresponds nearly to the accepted formula Ca[Al₂]Si₆O₁₆ + 5aq.

Found by *Seligmann* with heulandite, stilbite, etc., at Viesch, Canton Wallis, Switzerland, *Tenne*, J. Min., 1880, i., 285.

Tenne has examined the PARASTILBITE of von Waltershausen, and refers it with little question to epistilbite, J. Min., 1881, ix., 195.

Lüdecke finds that REISSITE (App. I., p. 14) is nearly identical in form with epistilbite (monoclinic), so that it should probably be united to that species; it differs only in hardness, and in that it is said to contain alkalis, J. Min., 1880, ii., 200; 1881, i., 162.

EPSOMITE, Min., p. 463.—Argentine Repub., analyses quoted by *Brackebusch*, Min. Argentin., 73, 1879.

A massive variety is called REICHARDTITE by *Krause* (Arch. Pharm., III., v., 423, and vi., 41, in Z. Ges. Nat., II., x., 554)—[the new name, however, is most unnecessary]. Crystalline, granular or foliated. Cleavage easy. G. = 1.6-1.7. Transparent to trans-

lucent. Fracture conchoidal. The analyses agree closely with the formula $MgSO_4 + 7aq$, viz.:

	SO_3	MgO	H_2O	
1. Stassfurt	(3) 39·23	9·83	51·17	= 100·22.
2. Leopoldshall	39·31	9·77	51·20	= 100·28.

Occurs forming thin layers associated with carnallite, at Stassfurt and Leopoldshall.

ERDMANNITE.—Engström (Inaug. Diss. Upsala, 1877. abstr. in Z. Kryst. iii., 199, 1878) has analyzed a mineral from the Stockö, Norway, which he regards as probably the same as that named erdmannite by Esmark (Min., p. 414, see Berlin, Pogg. Ann., lxxxviii., 162), and also identical with that analyzed by Michaelson and Nobel (Michaelsonite, Min., p. 289). He obtained: SiO_2 25·15, B_2O_3 8·18, ZrO_2 2·14, ThO_2 9·93, Fe_2O_3 3·01, Ce_2O_3 9·00, $Di_2(La_2)O_3$ 8·66, Y_2O_3 1·64, Er_2O_3 0·50, FeO 3·16, CaO 18·78, BeO 3·16, Na_2O 1·02, K_2O 0·42, H_2O 5·25 = 100. The author writes the formula $R_2SiO_3 + Be_2SiO_3 + 3aq$, and suggests a relation to datolite.

Another mineral related to erdmannite, analyzed by Damour (Ann. Ch. Phys., V., xii., 411, 1877) gave results varying somewhat widely from the above analysis; he found 12·10 p. c. H_2O (see *Homilite*, p. 59).

Erlilite. *H. C. Lewis*, Proc. Ac. Nat. Sc. Philad., 1880, 292. Minute acicular crystals, looking like tufts of white wool, observed in a cavity in quartz from Herkimer Co., N. Y.; chemical nature unknown. The cavity also contained a liquid of undetermined character. [A substance of unknown characters, not even proved to be new, does not deserve a name—the practice of provisionally attaching names in such cases is to be condemned.]

Eriochalcite. Copper chloride from Vesuvius (1870), by *Scacchi* (Bull. Soc. Min., i., 132).

ERSBYITE.—Min., p. 361; App. II., p. 19.

ERYTHRITE.—Min., p. 558; App. II., p. 19.

ERYTHROSIDERITE, App. II., p. 19.—Vesuvius, *Scacchi*, Contrib. Min., II., p. 42, 1874. **DOUGLASSITE**, from Douglasshall, is $2KCl$, $FeCl_2$, $2H_2O$, *Ochsenius*, *Precht*, Ber. Ch. Ges., xiii., 2328, 1881.

Erythrozincite. *Damour*, Bull. Soc. Min., iii., 156, 1880. Occurs in thin plates apparently crystalline. Color red. Streak pale yellow. Translucent. Contains sulphur, zinc, and manganese, as proved by a qualitative examination on the small amount of material available. B. B. gives sulphurous fumes in the open tube, fuses in the forceps to a blackish slag. Dissolves in nitric acid with the separation of a little sulphur. Occurs in veins of lapis lazuli, from Siberia. *Des Cloizeaux* (ib., iv., 40, 1881) finds that cleavage plates of this mineral show in polarized light a black cross (positive), resembling that of wurtzite, both natural and artificial. He concludes that it is probably a manganese variety of this mineral.

ESMARKITE.—See *Anorthite*, p. 7; and App. II., p. 19.

ETTRINGITE, App. II., p. 19.—Optically uniaxial, negative, *Bertrand*, Bull. Soc. Min., iv., 34, 1881.

Euchlorite.—See *Mica Group*, p. 77.

EUCLEASE, Min., p. 379; App. II., p. 19.—**Cryst.**, *Kulibin*, Verh. Min. Ges. St. Pet., II., xiv., 147, 1879. Brazil, *Guyot*, Z. Kryst., v., 250, 1880. From the Hohe Tauern, Tyrol, perhaps from Rauris, crystals described by *Becke*, Min. Petr. Mitth., iv., 147, 1881.

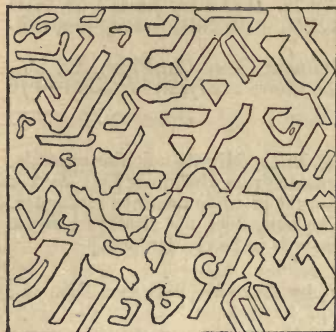
Eucrasite. *S. R. Paijkull*, Geol. För. Förh., iii., 350, 1877.

Orthorhombic (?). H. = 4·5–5. G. = 4·39. Lustre greasy. Color blackish brown. Streak

brown. Slightly translucent in thin splinters. Fracture uneven. Brittle. Analysis: SiO_2 16.20, TiO_2 1.27, SnO_2 (?) 1.15, ZrO_2 0.60, MnO_2 2.34, ThO_2 35.96, CeO_2 5.48, Ce_2O_3 6.13, La_2O_3 (Di_2O_3) 2.42, Y_2O_3 4.33, Er_2O_3 1.62, Fe_2O_3 4.25, Al_2O_3 1.77, CaO 4.60, MgO 0.95, K_2O 0.11, Na_2O 2.48, H_2O 9.15 = 100.21. The quantivalent ratio for $\bar{R} : [\bar{R}_2] : \bar{R} : \text{Si}(\text{Ti}) : \text{H} = 2.18 : 4.47 : 6.67 : 9.14 : 8.13$. B. B. fusible (at 4) on the edges. The borax bead in the R. F. is violet, in the O. F. yellow. In hydrochloric acid partially soluble, with the evolution of chlorine. Completely soluble in sulphuric acid. Occurs near Barkevik, Brevig, Norway. Named from $\epsilon\bar{\nu}$ and $\kappa\rho\acute{\alpha}\sigma\iota\varsigma$. [This is the mineral which has been referred, with a question, to polycrase, and also to polymignite, Dana, Min., p. 523. It seems, however, to be closely related to thortite, Min., p. 413.]

Eucryptite. *G. J. Brush* and *E. S. Dana*, Am. J. Sc., III., xx., 266, 1860.

Hexagonal. Cleavage probably basal. In symmetrically arranged crystals, imbedded in albite (see figure). $G. = 2.667$. Color white. Composition $\text{Li}_2[\text{Al}_2]\text{Si}_2\text{O}_8$, which requires: SiO_2 47.51, Al_2O_3 40.61, Li_2O 11.88 = 100. Gelatinizes in hydrochloric acid.



Eucryptite forms with albite an apparently homogeneous substance, called by the authors " β spodumene;" it is derived from the alteration of spodumene. The microscope shows the two minerals of which this substance is made up, and chemical analysis serves to separate the latter into a soluble portion (eucryptite), and an insoluble portion, albite. This is further explained, with analyses, on p. 113. From Branchville, Conn. Named from $\epsilon\bar{\nu}$, $\omega\epsilon\lambda\lambda$, and $\kappa\rho\nu\pi\tau\acute{o}\varsigma$, concealed.

EUDIALYTE, Min., p. 248; App. II., p. 19.—*Greenland*, v. *Kokscharof*, Verh. Min. Ges. St. Pet., II., xiv., 205, 1878; Min. Russl., viii., 29, 1878.

EUDNOPHITE, Min. p. 433.—*Anal.*, *Damour*, Bull. Soc. Min., iv., 239, 1881.

EULYITE, Min., p. 391; App. II., p. 19.—*Bertrand* regards the apparently tetrahedral crystals as formed of four rhombohedrons of 120° , placed with their vertices at a common point. A section cut parallel to a tetrahedral face exhibits, in converging polarized light, a single negative axis perpendicular to it, Bull. Soc. Min., iv., 61, 1881.

EURALITE.—App. I., p. 6.

EUSYNCHITE, Min., p. 609.—A related mineral from Laurium, Greece, gave *Pisani* (C. R., xcii., 1292, 1881): V_2O_5 25.53, PbO 50.75, CuO 18.40, CaO 1.53, H_2O 4.25 = 100.46, corresponding to $(\text{Pb}, \text{Cu})_2\text{V}_2\text{O}_8$, if the water is neglected. Occurs in crystalline crusts on quartz; color greenish black to olive green.

Another closely related mineral is called **TRITOCORITE** by *A. Frenzel* (Min. Petr. Mitth., iii., 506; iv., 97, 1881). Massive, structure fibrous-columnar. Cleavage parallel to fibres, distinct. $H. = 3.5$. $G. = 6.25$. Color blackish brown to yellowish brown. Analysis:

	V_2O_5	As_2O_5	PbO	CuO	ZnO	
(2)	24.41	3.76	53.90	7.04	11.06	= 100.17.

Formula approximately $\text{R}_2\text{V}_2\text{O}_8$, with $\text{R} = \text{Pb}, \text{Cu}, \text{Zn}$. B. B. fuses easily with intumescence, giving off arsenical fumes. On charcoal gives coatings of lead and zinc, and in R. F. a lead globule. Soluble in HNO_3 and in HCl . From "Mexico or South America." Named from $\tau\rho\iota\tau\acute{o}\varsigma$, third, and $\chi\rho\omega\rho\acute{\epsilon}\omega$, to follow, in allusion to its relation to eusynchite and aräoxene (Rammelsberg, Min. Chem., 2d ed., p. 290, 291).

EUXENITE, Min., p. 521; App. II., p. 20.—*Cryst. form*, *Brögger*, Z. Kryst., iii., 483, 1879.

A mineral occurring with samarskite in Mitchell Co., N. C., gave *J. L. Smith* (Am. J. Sc., III., xiii., 365, 1877): Cb_2O_5 54.12, WO_3 , SnO_2 0.21, Y_2O_3 , Ce_2O_3 24.10, U_2O_3 9.53, CaO 5.53, MnO 0.08, FeO 0.31, H_2O 5.70 = 99.58. $G = 4.593\text{--}4.642$. Color brownish black to hair brown; translucent in thin fragments; lustre resinous. [Smith calls this euxenite, but that it cannot be; for example, Rammelsberg finds in true euxenite 20–23.5 p. c. TiO_2 , and $G = 4.67\text{--}5.1$.]

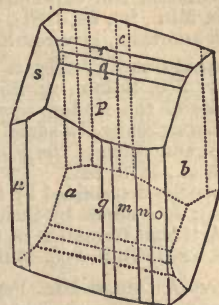
FAHLERZ.—See *Tetrahedrite*, p. 120.

FAHLUNITE.—Min., p. 484; App. II., p. 20.

Fairfieldite. *G. J. Brush* and *E. S. Dana*, Am. J. Sc., III., xvii., 359, 1879.

Triclinic. Axes: $c : b : a = 0.7065 : 3.5757 : 1.0000$ Observed planes (see figure) $i\text{--}i$ (a), $i\text{--}i$ (b), O (c), $i\text{--}\frac{1}{2}$ (g), I' (m), $i\text{--}\frac{1}{2}$ (n), $i\text{--}\frac{1}{2}$ (o), I (u), $-1'$ (p), $-\frac{1}{2}$ (q), $-\frac{1}{3}$ (r), $-4\text{--}4$ (s). Angles $ab = 78^\circ$, $ac = 92^\circ$, $ap = 123^\circ 30'$, $cp = 147^\circ$, $bp = 101^\circ 30'$. Cleavage b highly perfect, a less so. Usually in foliated to lamellar crystalline aggregates; occasionally curved, foliated, or fibrous, in radiating masses. $H = 3.5$ $G = 3.15$. Color white to pale straw yellow. Streak white. Lustre pearly to sub-adamantine, on the surface of perfect cleavage (b) very brilliant. Transparent. Brittle. The planes of light vibration intersect a in lines making angles of 40° and 50° with the obtuse edge a/b ; in the latter, an optic axis is visible toward the edge named. The planes intersect b in lines making angles of 10° and 80° with the edge a/b , the second axis visible in this plane.

Analyses by S. L. Penfield, 1, of a clear transparent variety, filling cavities in reddingite; 2, of the massive, somewhat friable variety:



	P_2O_5	FeO	MnO	CaO	Na_2O	K_2O	H_2O	Quartz	
1.	38.39	5.62	15.55	28.85	0.73	0.13	9.98	1.31	= 100.56.
2.	39.62	7.00	12.40	30.76	0.30	....	9.67	0.55	= 100.30.

The ratio of P_2O_5 : RO : H_2O is 1 : 3 : 2, and the formula $\text{R}_3\text{P}_2\text{O}_8 + 2\text{aq}$, with $\text{R} = \text{Ca}$: ($\text{Mn} + \text{Fe}$) = 2 : 1. This requires: P_2O_5 39.30, FeO 6.64, MnO 13.10, CaO 30.99, H_2O 9.97 = 100. B. B. glows, blackens, and fuses at 4.15 to a dark yellowish brown mass, coloring the flame pale green, with faint reddish yellow streaks on the upper edge. Reactions for iron and manganese with the fluxes. In the closed tube gives off neutral water; turns first yellow, then dark brown, and becomes magnetic. Soluble in HCl and HNO_3 . Occurs with other manganese phosphates at Branchville, Fairfield Co., Conn. In composition fairfieldite is analogous to roselite, p. 105.

FAMATINITE, App. II., p. 20.—With enargite from Cerro de Pasca, Peru, anal. *Frenzel* (J. Min., 1875, 679) S 33.46, Sb 10.93, As 7.62, Cu 41.11, Fe 6.43 = 99.55, corresponding to the formula $3\text{Cu}_3\text{S} + (\text{Sb}, \text{As})_3\text{S}_8$, or that of enargite.

According to *vom Rath* (Z. Kryst., iv., 426), the famatinites from the Argentine Republic, which also occurs with enargite (App. II., p. 20), has the same form and angles as the latter mineral, as was to be expected from the essential identity in composition.

See also *Enargite*, p. 41, and *Clarite*, p. 27.

FAUJASITE.—Min., p. 433; App. II., p. 20.

FELDSPAR GROUP, Min., pp. 335 to 361; and App. II., p. 20.—Cryst., methods of twinning of triclinic feldspars, *vom Rath*, J. Min., 1876, 169.

Microscopic structure, *Rutley*, Q. J. G. Soc., 1875, 479. Optical examination of microcline, orthoclase, and various triclinic feldspars, *Des Cloizeaux*, Ann. Ch. Phys., V., ix., 433, 1876. Cryst. and opt. examination, *Wiik*, Cefv. Finsk. Vet. Soc., xix., 60, 1876–77, giving results similar to those more fully obtained by Schuster (see below). Determination by optical methods in thin rock sections, *Lévy*, Ann. Min., VII., xii., 440 et seq., 1877;

see also *Thoulet*, Ann. Min., xiv., 115 et seq., 1878. Discussion of the specific gravities of the feldspar species, *Goldschmidt*, J. Min., Beil.-Bd., i., 203, 1881.

Schuster (Min. Petr. Mitth., iii., 117, 1880), has carried through a long series of observations as to the optical characters of the triclinic feldspars; and has established the important conclusion that in an optical sense there is the same gradual transition from one extreme (albite), to the other (anorthite), as is observed in the chemical composition. Thus, he finds that the position of the extinction-directions, as observed on the basal and clinodiagonal planes, the position of the axes of elasticity, the dispersion of the axes, and the axial angle, all show this gradual change in the same direction. These conclusions obviously confirm the now almost universally accepted view of Tschermak, that the intermediate triclinic feldspars (plagioclase) are to be regarded as isomorphous mixtures of albite and anorthite.

Mallard (Bull. Soc. Min., iv., 96, 1881), has gone further and shown that by means of formulas deduced by him (ib., p. 71), on the view that in isomorphous mixtures (as of albite and anorthite) each element usually enters without change of its own characters, it is possible to calculate the direction of extinction for the two planes (*O* and *i-λ*): the results of calculation and experiment agree very closely. Experiments by *Fouqué* and *Lévy* (Bull. Soc. Min., iv., 63, 1881), on a series of feldspathic microlites intermediate between albite and anorthite, give results at variance with the above conclusions.

Analyses of feldspars from various localities in Scotland, monograph, *Hedde*, Trans. Roy. Soc. Edinb., xxviii., 197 et seq., 1877; Min. Mag., ii., 36, 1878. From volcanic rocks of the Andes, *von Rath*, ZS. G. Ges., xvii., 295 et seq., 1875. Discussion of composition by the same, J. Min., 1875, 397. *Smita*, Min. Mitth., 1877, 265.

Examination of the feldspar pseudomorphs of the Wilhelmsleite, near Ilmenau, *Dalmer*, J. Min., 1878, 225.

Species determined by the flame reactions, *Szabó* (for title see Bibliography in Introduction); determined by their fusibility, *Bischof*, Dingl. Pol. Journ., cxxii., 319; cxxiii., 265.

Artificial formation of feldspar species: *Fouqué* and *Lévy*, C. R., lxxxvii., 700, 779; xc., 620, 1880; Bull. Soc. Min., iv., 63, 1881 (see also under *Orthoclase*, p. 87).

Genth (Report Min. Penn., p. 224, 1876) shows that the varieties of orthoclase, called by Lea lennilitite and delawarite, are identical; an analysis showed 9.11 K₂O, 4.88 Na₂O. Analysis of Lea's cassinite from Blue Hill, Delaware Co., gave:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	BaO	CaO	MgO	SrO	Na ₂ O	K ₂ O	ign
G. = 2.692 (3)	63.60	19.97	0.12	3.71	0.19	0.02	tr.	4.43	9.00	0.19 = 100.23.

This feldspar is remarkable for affording 3.7 p. c. BaO, but an optical examination is needed to decide its true relations.

Another feldspar containing barium has been described optically by Des Cloizeaux, and chemically by Pisani (Bull. Soc. Min., i., 84, 1878); locality unknown. Triclinic, with the angle between the cleavage planes = 86° 37' (near labradorite), in optical relations, approaches oligoclase and albite. An analysis gave:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	BaO	CaO	MgO	Na ₂ O	K ₂ O	ign
G. = 2.835	55.10	23.20	0.45	7.30	1.83	0.56	7.45	0.83	3.72 = 100.44.

Quantivalent ratio of R : [R₂] : Si = 1 : 3 : 8, or that of hyalophane, giving the formula (Na₂, Ba)[Al₂]Si₄O₁₂ [but note the loss of 3.7 p. c.].

See also *albite*, *anorthite*, *labradorite*, *microcline*, *oligoclase*, *orthoclase*.

FERGUSONITE, Min., p. 524; App. II., p. 21.—New localities: Rockport, Mass., anal. *J. L. Smith*, Am. J. Sc., III., xiii., 367, 1877; Burke Co., N. C., *id.*, Bull. Soc. Min., iii., 195, also *Hidden*, Am. J. Sc., III., xx., 150, 1880. Mitchell Co., N. C., *Shepard*, Am. J. Sc., III., xx., 57.

FERRITE.—App. II., p. 21.

FERROILMENTITE.—App. I., p. 6.

Ferrotellurite. *F. A. Genth*, Am. Phil. Soc., xvii., 119, 1877; or *Z. Kryst.*, ii., 8.

In delicate radiating tufts, also in very minute prismatic crystals. Color between straw

and lemon-yellow inclining to greenish yellow. Contains iron, tellurium. Composition suggested on the basis of a qualitative analysis, FeTeO_4 . Insoluble in ammonia; soluble in HCl . Found as a coating on quartz associated with native tellurium and tellurite, at the Keystone mine, Magnolia District, Colorado. [Needs further examination.]

FERROTUNGSTEN.—App. II., p. 21.

FIBROFERRITE, Min., p. 656; App. II., p. 21.—Anal., $[\text{Fe}_2]_2\text{S}_2\text{H}_4\text{O}_{11} + 8\text{aq}$, Chifli, Brun, Z. Kryst., v., 104, 1880.

FIBROLITE, Min., p. 373; App. II., p. 21.—St. Michel, Finland, *F. J. Wiik*, Z. Kryst., ii., 496.

Optical examination, orthorhombic, *Des Cloizeaux*, Bull. Soc. Min., iv., 258, 1881.

FICHELITE.—Min., p. 735; App. II., p. 21.

Fillowite. *G. J. Brush* and *E. S. Dana*, Am. J. Sc., III., xvii., 363, 1879.

Monoclinic; pseudo-rhombohedral. Axis c (vert.): $b : d = .8201 : .5779 : 1$; $\beta = 89^\circ 51'$. Observed planes (see fig.): O (c), $2-i$ (d), 1 (p). Angle $cd = 121^\circ 29'$, $cp = 121^\circ 20'$, $pp = 84^\circ 37'$. Cleavage basal, nearly perfect. In granular crystalline masses. $H. = 4.5$. $G. = 3.43$. Lustre sub-resinous to greasy. Color wax-yellow, yellowish to reddish brown, colorless. Streak white. Transparent to translucent. Analysis by S. L. Penfield:

	P_2O_5	FeO	MnO	CaO	Na_2O	Li_2O	H_2O	Quartz.
($\frac{2}{3}$)	39.10	9.33	39.42	4.08	5.74	0.06	1.66	0.88 = 100.27.

The ratio for $\text{P}_2\text{O}_5 : \text{RO} : \text{H}_2\text{O} = 1 : 3 : \frac{1}{2}$, and the formula is $3\text{R}_2\text{P}_2\text{O}_8 + \text{aq}$. If $\text{R} = \text{Mn} : \text{Fe} : \text{Ca} : \text{Na}_2 = 6 : 1 : 1 : 1$, this requires: P_2O_5 40.19, FeO 6.80, MnO 40.19, CaO 5.28, Na_2O 5.84, H_2O 1.70 = 100. B. B. fuses at 1.5, with intumescence to a black feebly magnetic mass, coloring the flame momentarily pale green, then intensely yellow. In the closed tube a little neutral water. With the fluxes reactions for manganese and iron. Soluble in HCl and HNO_3 .

Occurs with other manganesian phosphates, especially reddingite and triploidite, in a vein of albitic granite at Branchville, Conn. Named after Mr. A. N. Fillow, of Branchville.

FISCHERITE, Min. p. 582.—*Des Cloizeaux*, Verh. Min. Ges. St. Pet., II., xi., 32, 1876; *v. Kokscharof*, Min. Russl., vii., 23.

FLUOCERITE.—Min., p. 126; App. II. p. 21.

FLUORITE, Min., p. 123; App. II., p. 21.—Cryst., Striegau, Silesia, *v. Lasaulx*, J. Min., 1875, 134, and Z. Kryst., i., 359, 1877; Kongsberg, Norway, same, *ib.*, p. 368; Münsterthal, *Kloche*, Ber. Nat. Ges. Freiberg, vi., 461, 1876. Natural etchings on crystalline faces, due to trapezohedron 3-3. *Werner*, J. Min., 1881, i., 14.

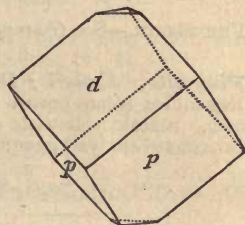
"Photo-electricity," *Hankel*, Wied. Ann., ii., 66, 1877. Constants of elasticity, *Klang*, Wied. Ann., xii., 321, 1881.

Dark-colored varieties from Wälsendorf ("antozonite") yield free fluorine on fresh fracture, perhaps from ceric fluoride, *Loew*, Ber. Chem. Ges., xiv., 1144, 1881.

According to Mallard (Ann. Min., VII., x., 115, 1876), fluorite is only pseudo-isometric, the method of grouping of the individual crystals being analogous to analcite (q. v.; also see p. viii).

FORESITE, App. II., p. 22.—Similar to stilbite in optical characters, *Des Cloizeaux*, J. Min., 1876, 640.

Analysis by *Sansoni*: ($\frac{2}{3}$) SiO_2 49.97, Al_2O_3 24.12, CaO 8.33, Na_2O , K_2O 0.46, H_2O 17.06, MgO tr. = 99.94. He calls attention to the similarity to stilbite, and questions whether the species is really independent of it. Att. Soc. Tosc., iv., 317, 1879.



Franklandite, *Reynolds*, Phil. Mag., V., iii., 284, 1877.

Massive, with fine fibrous structure. $H. = 1$. $G. = 1.65$. Color white. An analysis gave :

B_2O_3	CaO	Na_2O	H_2O	(Na, K) Cl	$CaSO_4 + 2aq.$
[43.76*]	12.10*	12.37	27.92	2.41	1.44 = 100.

* Other independent determinations gave B_2O_3 41.81, CaO 11.94, H_2O 27.66.

Deducting impurities, the formula deduced is $Na_4Ca_2B_2O_{22}, 15H_2O$. Slightly soluble in water, readily in dilute HCl and HNO_3 . Fuses easily. From Tarapaca, Peru. [Very near ulexite, Min., p. 598.]

FRANKLINITE, Min., p. 152; App. II., p. 22.—Franklin Furnace, N. J., analyses giving the spinel ratio, *Seym's*, Am. J. Sc., III., xii., 210, 1876.

Fredricite.—See *Tennantite*, p. 119.

FREIESLEBENITE, Min., p. 93; App. I., p. 4.—**Cryst.**, twins, Hiendelaencina, Spain, *Bücking*, Z. Kryst., ii., 425, 1878. *Urba* obtained identical results for the specific gravity of freieslebenite from Hiendelaencina, and diaphorite of Przi Bram, viz., 6.040; analysis by *Morawski*, quoted by him, yielded the same result, Z. Kryst., ii., 159, 1878.

Bertrand mentions diaphorite from Zancudo, New Granada, Bull. Soc. Min., iii., 111, 1880.

FRENZELITE.—See *Guanajuatite*, p. 53.

Freyalite. *Esmark*; *Damour*, Bull. Soc. Min., i., 33, 1878.

Resembles some brown thorites. Scratches glass slightly. $G. = 4.06-4.17$. Color brown. Streak yellowish gray. Translucent in thin splinters. Lustre resinous. An approximate analysis gave:

SiO_2	Ce_2O_3	La_2O_3, Di_2O_3	ThO_2	$Al_2O_3(ZrO_2?)$	Fe_2O_3	Mn_2O_4	K_2O, Na_2O	H_2O	ign.
20.02	28.80	2.47	28.39	6.31	2.47	1.78	2.33	7.40	0.82 = 100.79.

B. B. swells up but does not fuse. In the closed tube decrepitates, gives off water, and becomes white. With salt of phosphorus in R. F. dissolves, forming an opal-like glass, which in O. F. becomes brown, and on cooling is colorless and translucent. With borax in O. F. gives a transparent brown bead, becoming almost colorless on cooling, and showing in the spectroscope an absorption band on the border of the red and orange (Di). Dissolves readily in acid, giving gelatinous silica. With HCl chlorine is given off. From the neighborhood of Brevig, Norway.

Friedelite. *Bertrand*, C. R., lxxxii., 1167, 1876; Z. Kryst., i., 86.

Rhombohedral; c (vert.) = 0.5624. Crystals often tabular. Observed planes O , R , and I , the two last often striated parallel to their intersection-edge. $O \wedge R = 147^\circ$, $R \wedge R = 123^\circ 42'$. Double refraction strong, axis negative. Cleavage basal perfect. Massive, with saccharoidal structure and distinct cleavage, passing into close compact with indistinct cleavage. $H. = 4-5$. $G. = 3.07$. Color rose red. Powder pale rose. Transparent-translucent. Optically uniaxial, negative. Analysis (mean of several):

SiO_2	MnO (FeO tr.)	MgO, CaO	H_2O
36.12	53.05	2.96	7.87 = 100.

Formula deduced: $Mn_4Si_3O_{10}, 2H_2O$. B. B. fuses easily to a black glass. Gives off water in the closed tube. Reaction for manganese with the fluxes. In HCl dissolves, forming a jelly. Associated with rhodochrosite and alabandite at the manganese mine of Adervielle, vallée du Louron, Hautes Pyrénées. [The formula may be written $H_4Mn_4Si_3O_{12} = R_2SiO_4$, the composition then corresponds with that of diopside H_2CuSiO_4 , to which it seems to be related in form.]

Frieseite.—See *Sternbergite*, p. 115.

Frigidite.—See *Tetrahedrite*, p. 115.

GADOLINITE, Min., p. 293; App. II., p. 22.—Microscopic examination of specimens from different localities, *A. Sjögren*, Geol. För. Förh., iii., 258, 1877.

Anal., Stora Tuna, *G. Lindström*, Geol. För. Förh., ii., 218, 1874. *Humpidge* and *Burney*, J. Ch. Soc., xxxv., 117, 1879 (Z. Kryst., vi., 94).

Examination of earths contained, *Maignac*, Bibl. Univ. Gen., lxi., 283, 1878; (ytterbium), lxiv., 1878. Containing scandium, *Cleve*, Öfv. Ak Stockh., xxxvi., 7, p. 3, 1879.

GAHNITE, Min., p. 149; App. II., p. 23.—**Anal.**, Brazil, *Damour*, Bull. Soc. Min., i., 93, 1878. *Tiriolo*, Calabria, *Mauro*, Acc. Linc. Trans., III., iii., 65, 1879.

Formed with tridymite at a zinc furnace, from the alteration of the distillation vessels, *Schulze* and *Stelzner*, J. Min., 1881, i., 120.

GALENITE, Min., p. 40; App. II., p. 23.—**Cryst.**, Freiberg, etc., *Grotk*, Min.-Samml. Strassburg, p. 46, 1878. *Hesselbach*, Westphalia, vom *Rath*, Z. Kryst., iv., 428, 1880. "Schlagfiguren," *Weiss*, ZS. G. Ges., xxix., 209, 1877.

Habach, Salzburg (Bi_2S_3 1.97 p. c., G. = 7.50). Octahedral cleavage very perfect, cubic less so. After ignition cubic cleavage most readily obtained; with interposed twinning lamellæ parallel 3-3, v. *Zepharovich*, Z. Kryst., i., 155, 1877. A crystal (15 grams) with perfect octahedral cleavage has been found by *Brun* on the glacier of *Leschant*, Mont Blanc, Bull. Soc. Min., iv., 260, 1881.

Recent formation from *Bourbonne-les-Bains*, *Daubrée*, C. R., lxxx., 604, 1875; lxxxi., 184. Containing selenium, *Guanajuato*, Mexico, *Navia*, *Naturaleza*, iv., 42, 1877.

Pseudomorph after *staurolite*, *Brittany*, *Firket*, Bull. Soc. Geol. Belg., vi., 152, 1879.

See also *Huascolite*, p. 60.

Galenobismutite. *H. Sjögren*, Geol. För. Förh., iv., 109, 1878.

Massive, compact, sometimes radiated. H. = 3-4. G. = 6.88. Lustre metallic, brilliant. Color tin white. Streak grayish black, shining. Composition PbBiS_4 , or $\text{PbS} + \text{Bi}_2\text{S}_3 = \text{S } 16.95$, $\text{Bi } 55.62$, $\text{Pb } 27.43 = 100$. Analyses (l. c.):

	S	Bi	Pb	Fe	
1.	17.35	54.69	27.65	tr.	= 99.69.
2.	16.78	54.13	27.18	tr.	= 98.09.

B. B. reacts for bismuth and lead, fusing easily on charcoal. Dissolves with difficulty in hydrochloric acid, readily in strong nitric acid. Occurs with bismutite at the *Kogruvå*, *Nordmark*, *Wermland*, *Sweden*. Sometimes carries gold. [The bismuth compound corresponding to *zinkenite* and *sartorite*.]

A related mineral, containing a little selenium, is described by *Atterberg* as occurring at *Fahlun*, *Sweden* (Geol. För. Förh., ii., 76, 1874), as follows:

Massive. H. = 2-3. Lustre metallic. Color steel gray, becoming slightly reddish. An analysis gave ($\frac{2}{3}$): $\text{Bi } 68.40$, $\text{S } 10.39$, $\text{Se } 1.15$, $\text{Pb } 17.90$, $\text{Fe } 1.52$, insol. (quartz) $1.60 = 100.96$. The calculated formula is Bi_3PbS_5 . The substance is regarded as an intimate mixture of native bismuth with a sulphobismutite of lead (PbS , Bi_2S_3). The author adds that such mixtures, containing metallic bismuth, are not uncommon (see *Silaonite*, p. 53).

Another related mineral, also from *Fahlun*, has been examined by *Nordström* (ib., iv., 268, 1879), containing 4.79-5.11 p. c. Se.

Ganomalite. *Nordenskiöld*, Geol. För. Förh., iii., 121, 1876; 382, 1877.

Massive, without distinct cleavage. Strongly doubly-refracting. Optically biaxial, with very small angle (*Des Cloizeaux*, Bull. Soc. Min., i., 8, 1878). H. = 4. G. = 4.98. Lustre greasy. Colorless or white, to whitish-gray. Transparent. Composition $(\text{Pb}, \text{Mn})\text{SiO}_3$; approximate analysis, *G. Lindström*:

SiO_2	PbO	MnO	CaO	MgO
34.55	34.89	20.01	4.89	3.68 alkalis, ign. 1.88 = 99.58.

B. B. fuses easily to a clear glass, which in R. F. is colored black by reduced lead. On charcoal with soda a lead globule, and a coating of lead oxide. Easily soluble in nitric acid, with the separation of gelatinous silica.

Occurs very sparingly with tephroite (which it closely resembles), native lead, calcite, and jacobsite, at Långban, Wermland, Sweden. Named from $\gamma\alpha\nu\omega\alpha\iota\varsigma$, *brightness*.

Nordenskiöld (p. 384) mentions the occurrence at Långban, of a second lead silicate, very similar in appearance and blowpipe reactions to the above, but with two distinct cleavages, at an angle of $104^{\circ} 33'$. The material available was too scanty for full examination, but he suggests that it may be a more distinctly crystallized variety of ganomalite. [Compare the other lead silicates, *Kentrolite*, *Hyalotekite*, *Melanotekite*.]

GARNET, Min., p. 265; App. II., p. 23.—Cryst., Geyer, Saxony, *v. Lasaulx*, J. Min., 1875, 149. As a secondary mineral on trap rock, New Haven, Conn., also anal.; *E. S. Dana*, Am. J. Sc., III., xiv., 215, 1877. Pütschthal, Tyrol, *vom Rath*, Z. Kryst., ii., 173, 1878; Piz Alpetta, Dissentis, Switzerland, *vom Rath*, Z. Kryst., v., 495, 1881.

(Colophonite) possessing double-refraction, and in part, at least, to be referred to vesuvianite, *Wichmann*, Pogg., clvii., 282, 1876; *v. Lasaulx*, J. Min., 1876, 630. Specific gravity determinations, *Church*, Geol. Mag., II., ii., 321, 1875.

Anal., in lava of Santorin (melanite), *Fouqué*, C. R., lxxx., 631, 1875. Yancey Co., N. C. (spessartite), *König*, Proc. Ac. Nat. Sc. Philad., 1876, 53. St. Marcel (spessartite), *Pisani*, C. R., lxxxiii., 167, 1876. Fichtelgebirge, *v. Gerichten*, Ann. Ch. Pharm., clxxxv., 209. Kaiserstuhl (melanite, 3-7 p. c. TiO_2), *Knop*, Z. Kryst., i., 62, 1877. Scotland, several localities (11-15 p. c. MnO), *Heddle*, Min. Mag., ii., 85, 1878 (Trans. Roy. Soc. Ed., xxviii., 299 et seq., 1878). Leiperville, Delaware Co., Penn. (grossularite), *König*, Proc. Ac. Nat. Sc. Phil., 1878, 81. Ural (green var.), *Church*, Min. Mag., ii., 191, 1879 (but see Z. Kryst., v., 614). Pic Posets, near La Maladetta, Pyrenees (chrome) *Damour*, Bull. Soc. Min., ii., 165, 1879. Syssersk, Ural (demantoid), *Rammelsberg*, ZS. G. Ges., xxix., 819, 1877; *Waller*, Geol. För. Förh., iv., 184, 1878; *Lösch*, J. Min., 1879, 785 (see *Church*, above); *v. Kokscharof*, Min. Russl., viii., 310, 1881. Wakefield, Quebec (4.5 p. c. Cr_2O_3), *Harrington*, Can. Nat., II., ix., 305, 1880. New South Wales, *Liversidge*, Proc. Roy. Soc. N. S. W., Sept. 1, Nov. 3, 1880.

Absorption spectrum, *Vogel*, Ber. Chem. Ges., Berlin, x., 373, 1877.

Altered to chlorite, Lake Superior, *Pumpelly*, Am. J. Sc., III., x., 17, 1875.

Occurrence in Hungarian trachytes, *Szabó*, J. Min., Beil.-Bd., i., 202, 1881.

Referred by *Mallard* (Ann. Min., VII., x., 100, 1876) to the triclinic system (pseudo-isometric). His conclusions are supported by *Bertrand* (Bull. Soc. Min., iv., 12, 13, 1881), who describes more fully the supposed method of grouping of the biaxial elements. For example, a dodecahedral crystal of aploine, according to this view, is made up of 48 biaxial crystals in the form of triangular pyramids meeting at the centre of the dodecahedron; the bases of four of these pyramids together form a dodecahedral plane. The acute negative bisectrix is sensibly normal to the base of the pyramid, and the plane of the axes sensibly parallel to the longer diameter of the rhombic face; the axial angle is about 90° . *Bertrand* adds that such a crystal can be mechanically divided into the 48 individuals corresponding to the optical division [but see also p. viii, analcite, p. 5, boracite, p. 17].

GARNIERITE, App. II., p. 23.—It has been shown that, as previously suggested, the substance called garnierite is not a definite mineral, but consists of a hydrous magnesian silicate more or less impregnated with nickel oxide; the amounts of magnesia and nickel vary widely. Some writers, however, prefer to regard the Ni as chemically replacing the Mg (in $\text{RSiO}_3 + n\text{aq}$), but this seems very doubtful.—See *Ulrich*, Am. J. Sc., III., xi., 235, 1876; *Typeke* found in two samples, 55.90 and 66.97 SiO_2 , C. R., News, xxxiv., 193, 1876; *Garnier*, C. R., lxxxii., 1454, 1876; lxxxvi., 684, 1878; *Des Cloizeaux*, anal. by *Damour*, Bull. Soc. Min., i., 29, 1878; *vom Rath*, Ber. nied. Ges. Bonn, Jan. and July, 1878 (analyses by *Ulrich* and *Kiepenheuer*); *Liversidge*, Proc. Roy. Soc. N. S. W., Dec. 9, 1874, and Sept. 1, 1880. *Liversidge* calls the commonly occurring dark green unctuous mineral, *noumeaite*, and the rarer pale green adhesive mineral, *garnierite*; the latter he characterizes as a green-colored halloysite; in the former the NiO varies between 32.52 and 0.24 p. c., and the MgO between 10.61 and 24.82 p. c.

Similar deposits have been found in Spain, *Meissonier*, C. R., lxxxiii., 229, 1876.

Gastaldite.—See *Glaucophane*, p. 52.

GAY-LUSSITE, Min., p. 706.—According to Des Cloizeaux, the so-called pseudomorphs of calcium carbonate after gay-lussite, from Sangerhausen, have nothing to do with the latter mineral, but are probably pseudomorphs after celestite; Groth regards them as pseudomorphs after anhydrite (Min.-Samml. Strassburg, p. 142, 1878). Clarence King, however, describes large tufa-like deposits of calcium carbonate in Nevada, forming beds 20 to 60 feet thick, and at a height of 470 feet above the present level of Pyramid Lake. These deposits are regarded as the shore formation of an enormous lake, called Lake Lahontan, believed to have existed in quaternary times. This calcium carbonate shows occasionally crystalline forms resembling true gay-lussite, and the whole deposit is believed to have existed originally as this mineral. This view is supported by the fact that gay-lussite is now found well crystallized in a lake near Ragtown, Nevada, which is also a remnant of Lake Lahontan. For this pseudomorphous shore deposit King proposes the name of thiolite (from *Sis, shore*), Geology of the 40th Parallel, vol. i., 508, 1879.

Gay-lussite has been made artificially by Favre and Soret, Bull. Soc. Min., iv., 168, 1881. Crystallographic and optical examination of natural and artificial crystals, Arzruni, Z. Kryst., vi., 24, 1881.

Gedanite. Otto Helm, Arch. Pharm., III., xiii., 503, 1878 (Bull. Soc. Min., i., 133). A resin resembling amber, but not containing succinic acid, and less rich in oxygen. $H. = 1.5-2$. $G. = 1.053-1.068$. Color wine yellow, more or less clear. Transparent. Fragile. Fracture conchoidal. Analysis: C 81.01, H 11.41, O 7.33, S 0.25 = 100 (ash 0.06). Fuses to a clear odorless liquid at 180° , and sometimes at 140° . Found with amber on the shores of the Baltic. Named from *Gedanum*, Latin name of Danzig.

GEHLENITE.—Min., p. 370; App. II., p. 23.

GENTHITE.—Min., p. 471; App. II., p. 24.

GEOCROXITE, Min., p. 105.—Anal. (6 p. c. Cu), Björkskognäs, Sweden, Nauckhoff, Geol. För. Förh., i., 88, 1872.

GERSDORFFITE, Min., p. 72; App. II., p. 24.—Anal. (12.54 p. c. Co), Benahanis, prov. of Malaga, Spain, Genth, Am. Ch. J., i., 324, 1879.

An auriferous gersdorffite, from Rezbanya, Hungary, has been called **SOMMARUGAITE** (Bull. Soc. Min., i., 143).

GEYSERITE.—App. II., p. 24.

GIBBSITE, Min., p. 177.—Anal., French Guiana, Jannettaz, Bull. Soc. Min., i., 70, 1878.

GIESECKITE.—Min., p. 479; App. II., p. 24.

Ginilsite. (Fischer, Mitth.), Rammelsberg, Min. Chem., 2d ed., ii., 704; ZS. G. Ges., xxviii., 236, 1876.

Massive. Color grayish yellow. $G. = 3.404$. Analyses: 1, made in Rammelsberg's laboratory; 2, Rammelsberg, ZS. G. Ges., xxviii., 236, 1876.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	CaO	H ₂ O
1.	38.75	4.83	16.32	9.48	26.52	3.73 = 99.63.
2.	37.83	7.77	15.63	9.73	26.67	3.30 = 100.93.

Formula $R_2[R_2]_2Si_2O_{28} + 2aq$. This requires: SiO₂ 37.10, Al₂O₃ 7.85, Fe₂O₃ 16.07, MgO 4.42, CaO 26.33, H₂O 3.18 = 100. Earlier analyses by Fellenberg and others, giving very different results, are discarded by Rammelsberg. B. B. fuses on the edges to a dark glass. From Ginilsalp, Graubünden, Switzerland. [Needs further examination.]

GISMONDITE, Min., p. 418; App. II., p. 24.—Cryst., Salesel, Bohemia, Seligmann, Z. Kryst., i., 336, 1877. Schrauf, Z. Kryst., i., 596, 1877. Schlauroth, near Görlitz, A. v. La-saulz, Z. Kryst., iv., 172, 1879. The crystalline system of gismondite was first given as

tetragonal, afterward as orthorhombic. Later, Schrauf (l. c.) was led by the observed variations in angle to suggest that the crystals were twins, perhaps of triclinic individuals; von Lasaulx (l. c.) has carried on a more extended series of observations, both optical and crystallographic, and has established the truth of Schrauf's suggestion, showing the methods of twinning, and the way in which the pseudo-tetragonal forms result through it.

Giufite (or GIUFFITE).—See *Milarite*, p. 81.

GLANCESPAR.—App. II., p. 24.

GLASBACHITE.—App. II., p. 24.

GLAUBERITE, Min., p. 627; App. II., p. 24.—**Cryst.**, Pendschab, India, *Schimper*, Z. Kryst., i., 70, 1877.

Aranjuez, Tajo-Valley, optical investigation, *Laspeyres*, Z. Kryst., i., 529, 1877.

Anal., Atacama, *Domeyko*, 6th App., Min. Chili, p. 45, 1878.

GLAUCODOT, Min., p. 80; App. II., p. 25.—**Cryst.**, W. J. Lewis, Phil. Mag., V., iii., 354, 1877; *Becke*, Min. Mitth., 1877, 101. *Sadebeck*, Min. Mitth., 1877, 353. *Groth*, Min.-Samml. Strassburg, p. 42, 1878.

GLAUCONITE, Min., p. 462; App. II., p. 25.—**Anal.**, Is. Gozzo, v. *Bamberger*, Min. Mitth., 1877, 271. Ashgrove, near Elgin, Scotland, *Heddle*, Trans. Soc. Edinb., xxix., 79, 1879.

GLAUCOPHANE, Min., p. 244.—Near amphibole in form and composition, from Zermatt, *Bodewig*, Pogg. Ann., clviii., 224, 1876. Syra, anal., *Lüdecke*, ZS. G. Ges., xxviii., 249, 1876. With garnet and mica from Balade mine, Ouegoa, New Caledonia, anal., *Liversidge*, Proc. R. Soc. N. S. W., Sept. 1, 1880. Discussion of composition, *Dölter*, Z. Kryst., iv., 33, 1879. Analyses: 1, *Bodewig* (l. c.); 2, *Lüdecke* (l. c.); 3, *Liversidge* (l. c.).

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	
1. Zermatt, G. = 3.091	($\frac{1}{2}$) 57.81	12.03	2.17	5.78	....	13.07	2.20	7.33	= 100.45.
2. Syra,	55.64	15.11	3.08	6.85	0.56	7.80	2.40	9.34	= 100.78.
3. New Caledonia, G. = 3.12 ($\frac{1}{2}$)	52.79	14.44	....	9.82	tr.	11.02	4.29	5.26, K ₂ O 0.88, H ₂ O 1.38	= 99.83.

A mineral closely related to glaucophane, is called **GASTALDITE** by *G. Strüver*, Mem. Accad. Lincei, II., ii., 333, 1875. Description as follows:

Monoclinic. In prismatic crystals with *I* and *i-i*, but not distinctly terminated. In fibrous or columnar masses. Cleavage prismatic, 124° 25' (like amphibole). *H.* = 6-7. *G.* = 3.044. Lustre vitreous to pearly. Color azure blue to blackish blue. Streak grayish blue. Fracture conchoidal. Optic-axial plane clinodiagonal. Double refraction negative. Dispersion inclined; strongly pleochroic.

Composition: 3RSiO₃ + 2[Al₂]Si₂O₆, with R = Fe, Mg, Ca, Na₂. Analysis, *Cossa*:

	SiO ₂	Al ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O	
($\frac{1}{2}$)	58.55	21.40	9.04	3.92	2.03	4.77	tr.	= 99.71.

Occurs in the western Alps in chlorite slate in the valley of Aosta, at Brosso, near Ivrea, and in the valley of Locana, Italy, accompanied by pyrite, chalcopyrite, garnet, and apatite. Named after Prof. Bartolomeo Gastaldi.

GLAUCOPYRITE.—App. I., p. 6.

GMELINITE, Min., p. 436; App. II., p. 25.—**Analyses**, Nova Scotia and Bergen Hill, *Howe*, Am. J. Sc., III., xii., 270, 1876.

GOLD, Min., p. 3; App. II., p. 25.—**Cryst.**, v. *Kokscharof*, Min. Russl., vi., 321, 1874. *Syssertsk*, Ural, *Helmhacker*, Min. Mitth., 1877, 1. *Vom Rath*, Z. Kryst., i., 1, 1877.

W. J. Lewis, Phil. Mag., V., iii., 456, 1877. *Vöröspatak*, *Werner*, J. Min., 1881, i., 1 (occurrence, *Posepny*, Verh. Geol. Reichs., 1875, 97).

Gold and silver alloy (electrum) with 42.9 p. c. Ag, Comstock Lode, Nevada, *Attwood*, Am. J. Sc., III., ix., 229, 1875. From the Bodie mines, California; G. = 15.15; Ag = 36.4 p. c., *Hanks and Attwood*, Rep. State Min. Cal., p. 25, 1880.

Occurrence of gold and scheelite, Charity mine, Warren's, Idaho, and Golden Queen mine, Lake Co., Col., *Silliman*, Am. J. Sc., III., xiii., 451, 1877. Gold in Australia, *Wolff*, ZS. G. Ges., xxix., 82, 1877.

GOSLARITE, Min., p. 647.—Freiberg, cryst., (Schrauf), anal., *Frenzel*, J. Min., 1875, 675. Anal., Capanne Vecchie, Elba, *Grattarola*, Boll. Com. Geol., 1876, 342.

GÖTHITE, Min., p. 169; App. II., p. 25.—Cryst., Cornwall, *Groth*, Min.-Samml. Strassburg, p. 91, 1878.

Occurrence in Adair Co., Mo., *G. C. Broadhead*, Am. J. Sc., III., xiii., 420, 1877.

GRAHAMITE, Min., p. 753.—Huasteca, Mexico, occurrence, *Kimball*, Am. J. Sc., xii., 277, 1876.

GRAPHITE, Min., p. 24; App. II., p. 25.—Mexico, *Castillo*, Naturaleza, iii., 275, 1875. Siberia, anal., *Kern*, Chem. News, xxxii., 229, 1875.

GREENOCKITE, Min., p. 59; App. II., p. 25.—Cryst., von *Kokscharof*, Min. Russl., viii., 125, 1881.

GROCHAUTE—App. II., p. 25.

GRÜNAUTE, Min., p. 47.—See *Polydymite*, p. 95.

GUADALCAZARITE.—See *Onofrite*, p. 86, and App. II., p. 25.

GUANAJUATITE, App. II., p. 22.—The sulphoselenide of bismuth, from Guanajuato, Mexico, first mentioned by *Castillo* (1873), and fully described by *Frenzel* (J. Min., 1874, 679), was called *Frenzelite* in Append. II. (q. v.). It appears, however, that the same mineral was described in 1873 by V. Fernandez, and named *Guanajuatite* (La República: Periódico oficial del Gobierno del Estado de Guanajuato, July 13); the latter name has, consequently, the priority. Fernandez concludes that the mineral contains only Bi_2S_3 , the sulphur being due, in his opinion, to pyrite. He obtained: Se 35.18, Bi 61.00, gangue 3.70, Fe, S, loss 0.12 = 100. He also gives, H. = 3.5, G. = 6.62; the locality is the Santa Catarina mine, Sierra de Santa Rosa, near Guanajuato. The same mineral is called *castillite* by *Domeyko*, Min. Chili, 3d ed., p. 310, 1879.

Mallet has re-examined the mineral, and obtained (Am. J. Sc., III., xv., 294, 1878):

Se	S	Bi	Al_2O_3	Fe_2O_3	SiO_2	H_2O
31.64	0.61	59.92	2.53	tr.	3.47	1.46 = 99.63.

After deducting 6.72 p. c. halloysite, and 0.56 SiO_2 , present as impurities, the result obtained is: Se 34.33, S 0.65, Bi 55.01 = 100. The formula is then Bi_2Se_3 , with a little of the selenium replaced by sulphur; the pure mineral contains no zinc.

The SILAONITE of V. Fernandez and S. Navia (La República, Guanajuato, Mexico, Dec. 25, 1873), is a massive, bluish-gray mineral. H. = 2.75. G. = 6.43–6.45. Described as having the composition Bi_2Se_3 . Shown subsequently by Fernandez, and also by H. D. Bruns (Chem. News, xxxviii., 109, 1878), to be a mixture of guanajuatite and native bismuth, and not a homogeneous mineral.

GUANO, App. I., p. 6.—*Domeyko* (C. R., xc., 544, 1880), gives the following analyses of minerals occurring in the guano of Mejillones. (1) Of imperfect crystals in the form of rectangular prisms, implanted on walls of natural fractures in the rock; colorless, with vitreous lustre. (2) Fibrous and in very elongated crystals, pyramidal in form, grouped in diverg-

ing bundles; grayish, lustre vitreous. (3) In small concretions in the earthy mass of the guano; soft on exterior, within compact and homogeneous; amorphous; color yellowish.

	P ₂ O ₅	MgO	CaO	H ₂ O (and organic matter).	
1.	64.89	35.11	= 100.		
2.	40.13	18.53	5.80	36.00	= 100.46.
3.	27.60	24.38	0.14	38.30	B ₂ O ₃ 6.80 (Al ₂ O ₃) Fe ₂ O ₃ 2.30 = 99.52.

Guanipite.—See *Oxammite*, p. 88.

GUANOVOULITE.—App. II., p. 64.

GUARINITE, Min., p. 383; App. II., p. 26.—**Cryst.**, *Guiscardi*, Rend. Acc. Nap., Jan., 1876.

Guejarite. *Cumenge*, Bull. Soc. Min., ii., 201, 1879; *Friedel*, ib., ii., 203.

Orthorhombic; in prismatic (20 mm. long) crystals flattened parallel to the brachypinacoid, with the planes $i-2$, $i-\frac{3}{2}$, $i-\frac{5}{2}$ in the prismatic zone, also $1-\bar{i}$ and $\frac{1}{2}-\bar{i}$, and several others less certain. $I \wedge I = 101^\circ 9'$, $i-\bar{i} \wedge 1-\bar{i} = 128^\circ 6'$. Cleavage $i-\bar{i}$ neatly perfect (*Friedel*). $H. = 3.5$. $G. = 5.03$. Color steel gray, with a tinge of blue. Analysis, *Cumenge* (l. c.):

S	Sb	Cu	Fe	Pb
25.0	58.5	15.5	0.5	tr. = 99.5.

The calculated formula is $\text{Cu}_2\text{Sb}_2\text{S}_7$, or $\text{Cu}_2\text{S} + 2\text{Sb}_2\text{S}_3$. Related to chalcostibite (Min., p. 85), the formula for which is $\text{Cu}_2\text{S} + \text{Sb}_2\text{S}_3$, and which has $I \wedge I = 101^\circ$. B. B. on charcoal gives off antimonial fumes, and yields when treated with soda metallic copper. Occurs with siderite at the copper mines at the foot of Muley-Haceu, in the district of Guejar, Sierra Nevada, Andalusia.

GÜMBELITE, App. I., p. 6.—*Gümbel* (Min. Petr. Mitth., ii., 189, 1879), has analyzed a mineral occurring as the petrifying material of coal plants in the Tarentaise, with the following results: SiO_2 49.71, TiO_2 1.04, Al_2O_3 28.62, Fe_2O_3 2.69, MnO tr., MgO 1.60, CaO tr., K_2O 6.80, Na_2O 2.21, H_2O 7.38 (and coal) = 100.05. It occurs in fine white pearly scales, somewhat greasy to the feel. $G. = 2.8$. Exfoliates like pyrophyllite. These results show that the mineral is essentially the same as that called gümbelite by von Kobell, or a sort of pinite. *Genth* (Am. Phil. Soc. Philad., xviii., 259, 1879), describes a mineral occurring in a similar manner to the above in coal shales, and as a petrifying material; but it is a true pyrophyllite.

GUMMITE, Min., p. 179.—Occurrence at the Flat Rock mine, Mitchell Co., N. C., *Kerr*, Am. J. Sc., III., xiv., 496, 1877; *Hidden*, ib., xxii., 22, 1881. *Genth* (Am. Chem. J., i., 89, 1879), has analyzed this gummite from North Carolina, and concludes that it is a mechanical mixture of uranium hydrate, uranotil, lead uranate, and barium uranate.

GYPSUM, Min., p. 637; App. II., p. 26.—**Cryst.**, *Laspeyres*, Min. Mitth., 1875, 113 (*Reusch*, ib., 1876, 67). *Klien*, Pogg. Ann., clvii., 611, 1876.

Elasticity in different directions, *Coromilas*, Z. Kryst., i., 407, 1877. Magnitude and position of optical axes of elasticity, *von Lang*, Ber. Ak. Wien, lxxvi., 793, 1877. Etching figures, *Weiss*, ZS. G. Ges., xxix., 211, 1877. Thermo-electrical properties, *Hankel*, Wied. Ann., i., 277, 1877. Influence of heat on double refraction, *Dufet*, Bull. Soc. Min., iv., 113, 191, 1831.

Occurrence at Vesuvius, *Seacchi*, Att. Acc. Napoli, vi. (Contr. Min., ii., 57).

GYROLITE, Min., p. 398. See *Tobermorite*, p. 123.

Haddamite.—See *Microilite*, p. 80.

HALITE, Min., p. 112.—Vesuvius, *Scacchi*, Att. Acc. Nap., vi., 1873 (Contr. Min., ii., 23). Elasticity in different directions determined, *Voigt*, Pogg. Ann., Erg.-Bd., vii., 1, 177, 1875; *Groth*, Pogg. Ann., clvii., 115, 1876.

Figures produced by etching, *Sohncke*, Pogg. Ann., clvii., 329, 1876; *Exner*, ib., clviii., 319, 1876.

An argentiferous variety of halite is called HUANTAJAYITE by *Raimondi* (in Domeyko, 5th Appendix Min. Chili, 1876; also Min. Pérou, p. 64, 1878).

Isometric; occurs in cubes, also in incrustations made up of minute cubic crystals, also fibrous. H. = 2. Color white, not altered by exposure. Transparent. Fragile not sectile like cerargyrite. Composition: 20NaCl + AgCl; an analysis (3) gave: NaCl 89, AgCl 11 = 100. B. B. decrepitates and fuses easily; on charcoal yields silver with soda. Occurs in a calcareous gangue with cerargyrite, embolite, etc., at the mine of San Simon, Huantajaya, Tarapaca, Peru. Called *lechedor* by the miners. First described by *Raimondi* in the Annales de la Société de Pharmacie de Lima, 1873. See also Domeyko, Ann. Min., VII., xix., 329, 1881.

HALLITE.—App. II., p. 26.

HALLOYSITE, Min., p. 475; App. II., p. 26.—Anal., Steinbrück, *Gamper*, Verh. G. Reichs., 1876, 354. Tüffer, Styria, *John*, Jahrb. G. Reichs., 1878, 386. Drenkova, Banat, *Helmhacker*, Min. Petr. Mitth., ii., 231, 1879. Distr. San Mateo, Peru, *Raimondi*, Min. Pérou, p. 304, 1878.

A white porcelain clay, valuable in the arts, from Lawrence Co., Indiana, is called INDIANAITE by *Cox* (Rep. Geol. Indiana, 1874, 15; 1878, 154). It occurs with allophane in beds four to ten feet thick. H. = 2-2.5. G. = 2.31-2.53. Analyses, 1, 2, 3, by *Pemberton*:

SiO ₂	Al ₂ O ₃	H ₂ O	H ₂ O at 100° C.	CaO, MgO	Alkalies.
39.00	36.00	14.00	9.50	0.63	0.54 = 99.67.
39.35	36.35	22.90		0.40	.... = 99.00.
38.90	37.40	23.60		undet.	.... = 99.90.

HALOTRICHITE, Min., p. 654.—Anal., *Idria*, v. *Zepharovich*, Ber. Ak. Wien, lxxxix., 183, 1879.

HAMAETITE.—See *Bastnäsite*, App. I., p. 2 and 7; also *Tysonite* in this App., p. 126.

Hannayite. *vom Rath*, Ber. nied. Ges. Bonn, Jan. 13, 1878; Bull. Soc. Min., ii., 79, 1879.

Triclinic; in prismatic crystals, $I \wedge T = 114^\circ 34'$, $I \wedge i\bar{3} = 140^\circ 28'$. Cleavage basal perfect, less so, parallel I and I' . Prismatic planes vertically striated. G. = 1.893. Analysis by *MacIvor*:

($\frac{1}{2}$)	P ₂ O ₅	MgO	H ₃ N	H ₂ O
	45.70	18.90	8.09	28.20 = 100.89.

Heated 36 hours at 100° undergoes no change; between 100° and 110° or 115° loses 21.08 p. c., becoming opaque; heated over a Bunsen flame loses the remainder of the water and the ammonia (36.48 = total loss). The remainder fuses, but dissolves only in part in concentrated HCl. Taking the loss between 100° and 120° as water of crystallization, the formula is H₁(NΠ₁)Mg₃P₄O₁₆ + 8aq, which requires: P₂O₅ 44.38, MgO 18.75, H₃N 8.75, H₂O 23.12 = 100.

Discovered by *MacIvor* of Melbourne in the guano of the Skipton caves, Victoria, and recognized as new by *Ulrich*, as stated in a letter to *vom Rath*; occurs with struvite and newberyite. Named after Prof. J. B. Hannay, of Manchester.

HARMOTOME, Min., p. 439; App. II., p. 26.—*Mallard* (Ann. Min., VII., x., 153, 1876), following *Des Cloizeaux*, classes harmotome among pseudo-orthorhombic species, and calls attention to its relation in form to analcite and also phillipsite. *Baumhauer* (Z. Kryst., ii., 113, 1878) describes the results of a careful optical examination, and doubts the correctness

of referring it to the monoclinic system, but *Fresenius* (ib., iii., 42) supports the conclusion of Des Cloizeaux.

HATCHETTITE, Min., p. 731; App. II., p. 26. Monte Falo, near Savigno, Italy, *Casali, Bombicci*, Mem. Ac. Bologna, III., viii., 1877 (Z. Kryst., ii., 506).

Hatchettolite. *J. L. Smith*, Am. J. Sci., III., xiii., 365, May, 1877. *O. D. Allen*, ibid., xiv., 128, Aug., 1877.

Isometric; in octahedrons with planes of the cube, and 3-3. H. = 5. G. = 4.77-4.90. Lustre resinous. Color yellowish brown. Translucent. Fracture subconchoidal.

Analyses: 1, 2, 3, Smith (l. c.); 4, 5, Allen (l. c.):

	Ta ₂ O ₅	Cb ₂ O ₅	TiO ₂	WO ₃	SnO ₂	UO ₃	CaO	Y ₂ O ₃ *	FeO	MgO	K ₂ O	Na ₂ O	H ₂ O	
1.	66.01	....	....	0.75	15.20	7.72	2.00	2.08	....	0.50	....	5.16	Pb tr. = 99.42, Smith.
2.	67.86	....	....	0.60	15.63	7.09	0.86	2.51	....	1.21	....	4.42	= 100.18, Smith.
3.	67.25	....	....	0.91	16.01	7.11	0.64	2.12	....	undet.	....	5.02	= 99.06, Smith.
4.	29.83	34.24	1.61	0.30	15.50	8.87	....	2.19	0.15	tr.	1.37	4.49	Pb tr. = 98.55, Allen.
5.	29.60	35.94	....	....	....	8.89	....	2.33	....	....	....	....	Allen.

* With cerium oxide.

From analysis 4 Allen deduces the formula $\overset{I}{R}_2\overset{V}{R}_2O_7 + 2\overset{II}{R}\overset{V}{R}_2O_6 + 4aq$, with R = UO₂, Ce, Fe, Mg, Na₂, and $\overset{V}{R}$ = Ta, Cb. Allen calls attention to the close relation to pyrochlore, and suggests that the original mineral in this case may have been anhydrous and hence analogous to it in composition. The pyrognostic characters are near those of pyrochlore.

Occurs with samarskite, sometimes implanted on the former mineral, in the mica mines of Mitchell Co., North Carolina. Named after the English chemist Hatchett.

Haughtonite.—See *Mica Group*, p. 77.

HAÜYHITE, Min., p. 332; App. II., p. 26.—**Cryst.**, Albani Mts., *Sella*, Z. Kryst., i., 235, 1877.

HAYESINE, Min., p. 599.—**Anal.**, Atacama, Chili, *Domeyko*, Ann. Min., VII., x., 26, 1876.

HEDYPHANE, Min., p. 537.—Långban, Sweden, *Lindström* (Geol. För. Förh., iv., 266, 1879. G. = 5.82. Color white or yellowish white. Analysis after deducting a little CaCO₃: As₂O₃ 29.01, P₂O₅ 0.55, PbO 41.01, BaO 8.27, CaO 7.85, MgO 0.25, Pb 9.17, Cl 3.14, Fe₂O₃ 0.08, Na₂O 0.15, K₂O 0.09 = 99.57; this corresponds to the usual formula 3R₃As₂O₈ + PbCl₂, but the variety is remarkable as containing so much barium. The hedyphane of Paisberg contains no barium or at most only a trace.

According to *Des Cloizeaux* (Bull. Soc. Min., iv., 93, 1881), the Långban hedyphane is monoclinic and perhaps isomorphous with caryinite, p. 20.

See also *Mimetite*, p. 81.

HEBRONITE.—See *Amblygonite*, p. 5.

Heldburgite. *Luedecke*, Zeitsch. gesamt. Nat., III., iv., 291, 884, 1879.

Tetragonal, *c* (vert.) = 0.7500. In minute (3 mm. long, $\frac{1}{2}$ to $\frac{1}{3}$ mm. thick), prismatic crystals. Planes *i-i*, *I*, 1; angle $I \wedge 1 = 136^\circ 41'$ (near zircon). In habit resembles guarinite. H. less than that of steel. Lustre adamantine. Color yellow. Streak white. Transparent. B. B. infusible. Composition unknown (TiO₂ absent). Occurs in the feldspar of the phonolyte of the Heldburg near Coburg. [Needs further examination.]

HELVITE, Min., 234; App. II., p. 27.

HEMATITE, Min., p. 140; App. II., p. 27.—**Cryst.**, Vesuvius, *Seacchi*, Att. Accad. Napoli, vi., 1873 (Contr. Min., ii., 1). *Sadebeck*, Pogg. Ann., clvi., 557. Binnenthal, *Bücking*, Z. Kryst., i., 532; ii. 416. *Groth*, Min.-Samml. Strassburg, p. 73, 1878. Biancaville, Etna, *v. Lasaulx*, Z. Kryst., iii., 294, 1879. Reichenstein, Silesia, *Hare*, Z. Kryst., iv., 297, 1879. Ascension Island, *von Rath*, Z. Kryst., vi., 192, 1881.

Crystallogenic observations, *Scharff*, Jahresb. Senck. Nat. Ges., 1879-80.

With magnoferrite, octahedral crystals, *Vesuvius*, vom *Rath*, J. Min., 1876, 386. With magnetite in parallel position, *Bücking*, Z. Kryst., i., 575; do. with marcasite, *Sadebeck*, Pogg. Ann. Erg.-Bd., viii., 625

HENRYITE.—App. II., p. 27.

Henwoodite. *J. H. Collins*, Min. Mag., i., 11, 1876; *C. Le Neve Foster*, *ibid.*, p. 8.

In botryoidal globular masses having a crystalline structure. H. = 4-4.5. G. = 2.67. Color turquoise blue. Streak white with bluish green tinge. Fracture conchoidal. Analyses, *Collins* (l. c.):

	P ₂ O ₅	Al ₂ O ₃	Fe ₂ O ₃	CuO	CaO	H ₂ O	SiO ₂	
1.	48.94	18.24	2.74	7.10	0.54	17.10	1.37	Loss 3.97 = 100.
2.	48.20	....	....	7.00	....	19.50	....

The iron, lime, and silica are regarded as due to impurities; but aside from this the analyses are so obviously imperfect, that it is useless to attempt to give a formula; the mineral, however, seems to be related most closely to turquoise. In the closed tube decrepitates slightly, gives off water, and turns brown. B. B. infusible, colors the flame green. Copper reactions with borax. Occurs on limonite at the West Phenix mine, Cornwall. Named from Mr. Wm. Jory Henwood.

Hermannolite. See *Columbite*, p. 29.

Herregrundite. *Brezina*, Z. Kryst., iii., 359, March 25, 1879. URVÖLGYITE. *Szabó*, Min. Mitth., ii., 311, 1879 (Lit. Ber. Ungarn, iii., 510, 1879).

Monoclinic (triclinic?): *c* (vert.): *b* : *a* = 2.8004 : 1 : 1.8161. $\beta = 91^\circ 9'$. Observed planes: *O*, $-\frac{1}{2}i$, $-\frac{1}{4}i$, $\frac{1}{2}i$, $\frac{1}{4}i$, 1, *I*, $i-\frac{2}{3}$, $i-\frac{1}{3}$, $i-\frac{2}{3}$, $i-\frac{1}{3}$, $i-\frac{2}{3}$, $i-\frac{1}{3}$. $I \wedge I = 57^\circ 42'$, $O \wedge 1 = 106^\circ 52'$, $O \wedge I = 90^\circ 34'$. Cleavage basal perfect. *I* less so, also $i-2$ or $i-\frac{2}{3}$ (?). Occurs in spherical groups of thin six-sided plates. The basal plane striated parallel $i-i$. Twinning plane generally *O*. Optic axes in plane parallel to the direction of striation. $2E_a = 59^\circ 2'$ (Li), $65^\circ 18'$ to $66^\circ 53'$ (Na), $68^\circ 39'$ (Ti). Double refraction negative. (*Brezina*.) Dichroism weak, bluish green and greenish yellow. H. = 2.5. G. = 3.132. (*Winkler*.) Lustre vitreous, on cleavage face sometimes pearly. Color emerald green, verdigris green, and bluish green. Streak light green. Transparent. Analyses; 1, *Berwerth*, Z. Kryst., iii., 373; 2, *Schenek*, Min. Mitth., ii., 315, 1879.

	SO ₃	CuO	CaO	H ₂ O	
1.	24.62	54.16	2.05	19.61	= 100.
2.	24.62	49.52	8.59	16.73, S ₂ O ₂ 0.33, FeO 0.14, MnO, MgO tr.	= 99.93.

Brezina regards the CaO as present in the form of gypsum as an impurity; deducting this the result obtained is: SO₃ 23.04, CuO 57.52, H₂O 19.44 = 100. *Szabó*, on the contrary, regards the CaO as essential, and writes the formula: (CuSO₄ + aq) + 3H₂CuO₂ + (CaSO₄ + 2aq). [The view of *Szabó* seems very improbable, and is not established by his experiments made to decide the point; the mineral needs further examination on the chemical side.]

Occurs with malachite and calcite in a quartz conglomerate at Herregrund in Hungary. Related to langite, brochantite, etc. Named from the locality Herregrund = Urvölgy in Hungarian.

HERSCHELITE, Min., p. 437; App. II., p. 27.—The herschelite of Richmond, Victoria (called seebachite by *Bauer*, App. II., p. 50), is referred to phacolite (chabazite) by *von Rath* (Ber. Ak. Berlin, 1875, 523); *Beeke*, however, shows (Min. Petr. Mitth., ii., 416, 1879), that it differs from chabazite; he regards the form as monoclinic united by twinning in a manner analogous to, but not identical with, chabazite. A similar result is reached by *von Lasaulx* (Z. Kryst., v., 338, 1881) for the herschelite from Aci Castello, Sicily; an analysis yielded: SiO₂ 47.15, Al₂O₃ 21.42 (with Fe₂O₃), CaO 5.34 (with MgO), Na₂O, K₂O [6.69], H₂O 19.40 = 100, leading to the formula (Na, K)₂Ca [Al₂]₂Si₂O₂₂ + 12aq.

HESSITE, Min., p. 50; App. II., p. 27.—*Schrauf* (Z. Kryst., ii., 242, 1878), describes a highly modified crystal from Rezbanya; he refers it to the isometric system, and shows that the species is isomorphous with argentite, he notes, however, the variations in the measured angles, but concludes that they fall within the probable errors of observation. *Krenner* (Z. Kryst., iv., 542), describes isometric crystals of unusual perfection from the Jacob and Anna mine, Botes Mt., between Zalathna and Vöröspatak, Transylvania. *Becke* (Min. Petr. Mitth., iii., 301, 1880) has subjected the crystals from Botes to a careful examination, and argues [but not conclusively] that they must be referred to the triclinic system, although they closely approximate to the isometric form. An analysis gave him: Ag 60.60, Au 1.37, Te 37.22, quartz 0.40 = 99.68, corresponding to Ag_2Te with, as assumed by the author, a little Au_2Te_3 .

From Kearsarge mine, Dry Cañon, Utah, *Genth* (anal. by *Raht*), Am. Phil. Soc. Philad., xvii., 115, 1877 (or Z. Kryst., ii., 3). Chili, *Domeyko*, C. R., lxxxii., 632, 1875.

HETÆROLITE. *G. E. Moore*, Am. J. Sc., III., xiv., 423, Nov., 1877. **HETAIRITE**, *Nau- mann-Zirkel*, Min., 11 ed., p. 371.

Announced as follows, but not fully described: In botryoidal coatings with columnar radiate structure. H. = 5. G. = 4.933. Lustre metallic to submetallic. Color black. Streak brownish black. Opaque. Brittle. Contains zinc and manganese, and stated to be a zinc hausmannite, but no analyses published. Occurs intimately associated with chalcophanite (whence name from *ἑταῖρος*, *companion*) at the Passaic zinc mine, Sterling Hill, New Jersey. [A more complete description is needed.]

HETAIRITE.—See *Hetærolite*.

HETEROGENITE, App. II., p. 27.—St. Anton mine, Heubach, near Wittichen, Baden, *Sandberger*, J. Min., 1876, 280.

HETEROMORPHITE.—See *Jamesonite*, p. 64.

Heubachite. *F. Sandberger*, Ber. Ak. München, 1876, 238.

In thin soot-like incrustations; in dendritic or small spherical aggregates. H. = 2.5. G. = 3.44. Color deep black. Streak submetallic. Analysis, *Zeitschel* (l. c.):

Co_2O_3	Ni_2O_3	Fe_2O_3	Mn_2O_3	H_2O
65.50	14.50	5.13	1.50	12.59 = 99.22.

This corresponds to $3R_2O_3 + 4H_2O$. B. B. infusible. Soluble in concentrated hydrochloric acid, with evolution of chlorine; the solution deep bluish green, but on dilution with water becomes rose red. Occurs as a secondary product coating barite at the St. Anton mine, in the Heubachthal, near Wittichen, Baden; also at the mine Eberhard, near Alpirsbach, Würtemberg. This mineral was first referred to heterogenite by *Sandberger*, J. Min., 1876, 280. [Is the substance homogeneous?]

HEULANDITE, Min., p. 444; App. II., p. 28.—**Cryst.**, Turkestan, *v. Jeremejef*, Verh. Min. Ges. St. Pet., II., xiii., 389 (Z. Kryst., ii., 503).

Anal., Orange Free State, So. Africa, *Cohen*, J. Min., 1875, 116. San Piero, Elba, *Grattarola* and *Sansoni*, Att. Acc. Tosc., iv., 175, 1879; *ib.*, p. 314.

Occurs at Leiperville, Delaware Co., Penn., *König*, Z. Kryst., ii., 303, 1878.

See also *Epistibite*, p. 42; and *Oryzite*, p. 87.

Hexagonite.—See *Amphibole*, p. 5.

Hibbertite. *Hedde*, Min. Mag., ii., 24, 1878.

Pulverulent. Color lemon yellow. Analysis after deducting 20.68 p. c. of the matrix, kammererite, insoluble in dilute acid: CO 25.44, FeO 3.23, MnO 0.58, MgO 26.56, CaO 28.46, H_2O 15.73 = 100. From a quarry of chromite on the island of Unst. Named after Mr. Hibbert, the discoverer of the chromite. [The investigation of the substance is not sufficiently complete to prove that it is a distinct species; it seem to be a mixture allied to predazzite and penacite, Min., p. 708, 709; and App. II., p. 45]

Hiddenite.—See *Spodumene*, p. 112.

HISINGERITE, Min., p. 489; App. II., p. 28.—**Anal.** of a related mineral (Collins), Japan, *Milne*, Min. Mag., iii, 99, 1879.

Hofmannite. *Bechi*, Acc. Linc. Trans., III., ii., 135, 1878. Occurs in tabular crystals, shaped like rhombs; they are colorless, tasteless, and odorless. $G. = 1.0565$. Soluble in alcohol (5 pts. in 1000 pts. alcohol at 14°) more readily than in ether. Melts at 71° to a fluid resembling olive oil, burns with a bright flame. Composition $C_{20}H_{30}O$; an analysis gave: C 82.23, H 12.20, O 5.57. Forms a white crystalline efflorescence on lignite in the neighborhood of Siena. Named after Prof. A. W. Hofmann, of Berlin.

Homilite. *S. R. Paijkull*, Geol. För. Förh., iii., 229, 1876. *Des Cloizeaux* and *Damour*, ib., iii., 385, 1877, or Ann. Chim. Phys., V., xii., 405, 1877.

Monoclinic. In angles closely related to gadolinite and datolite. $I \wedge I = 116^\circ$, $O \wedge i-i = 90^\circ 39'$, $O \wedge 2-i = 147^\circ 20'$ ($O, I, 2-i = i-i, 2-i, I$ of datolite, Min., p. 380). Crystals octahedral in habit by extension of I and $2-i$, also O and $i-i$ prominent. Cleavage indistinct. Axes in a plane perpendicular to plane of symmetry, bisectrix nearly parallel to prismatic edge. $2H_2 = 97^\circ 5'$ to $98^\circ 22'$ (red). Dispersion $\rho > v$, also of bisectrices horizontal (*Des Cloizeaux*). $H. = 4.5-5$ (5.5 *Paijkull*). $G. = 3.34$ (3.28 *Paijkull*). Lustre resinous to vitreous. Color black or blackish brown. Streak grayish. Translucent in thin splinters. Analyses: 1, *Paijkull* (l. c.); 2, *Damour* (l. c.);

	SiO ₂	B ₂ O ₃	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Ce ₂ O ₃ *	Na ₂ O	K ₂ O	ign.
1.	31.87	[18.08]	1.50	2.15	16.25	...	0.52	27.28	...	1.09	0.41	0.85 = 100.
2.	33.00	[15.21]	....	....	18.18	0.74	...	27.00	2.56	1.01	....	2.30 = 100.

* With La_2O_3, Di_2O_3 .

From analysis 1 the following formula is calculated: $FeCa_2B_2Si_2O_{10}$, which corresponds closely with that of datolite, to which the mineral is similar in crystalline form. This similarity was first pointed out by *Nordenskiöld* (Geol. För. Förh., iii., 232, 1876). *B. B. homilite* fuses very readily to a black glass; reacts for iron and boracic acid. Completely decomposed by HCl with gelatinization. Found on the Stockö near Brevig, Norway, with meliphanite and erdmannite. Named from *ὁμιλέω*, to occur together.

Des Cloizeaux remarks that some crystals of homilite are throughout doubly refracting, others are composed of a green doubly refracting kernel surrounded by a yellowish crust of singly refracting material, while still others are entirely singly refracting. In this respect it is closely similar to gadolinite; whether this variation is certainly due to alteration does not appear. An analysis of some of the isotropic, brownish-colored fragments gave *Damour* ($G. = 3.03$): SiO₂ 28.01, B₂O₃ 5.54, ZrO₂ 3.47, Al₂O₃ 3.31, CeO 19.28, DiO, LaO 8.09, FeO 5.42, MnO 1.35, CaO 11.00, K₂O 1.98, SnO₂ 0.45, H₂O 12.10, TiO₂ tr. = 100. *Damour* remarks the similarity in appearance of the isotropic mineral analyzed by him to true erdmannite, and adds that the mineral supposed to be the latter contains no boron (see also p. 43).

HOPEITE, Min., p. 54.—*Damour* and *Des Cloizeaux*, Bull. Soc. Min., ii., 131, 1879. *Friedel* and *Sarasin*, ib., p. 153.

Des Cloizeaux has made a crystallographic and optical examination of hopeite, confirming and extending the results of *Lévy* and *Haidinger*. *Damour* shows that it is essentially a zinc phosphate, and *Friedel* and *Sarasin* have succeeded in forming artificially crystals which have the form and optical properties of hopeite, and which have the composition $Zn_3P_2O_8 + 4aq$, which requires: P₂O₅ 31.07, ZnO 53.18, H₂O 15.75. They conclude that this formula expresses also the composition of natural hopeite. According to *Schrauf* his new species *eggonite* (q. v.) is closely related in form to hopeite.

HORBÄCHITE.—App. II., p. 28.

HORNLENDE.—See *Amphibole*, p. 5.

HORTONOLITE.—App. I., p. 7.

HOWLITE.—Min., p. 598; App. II., p. 28.

Huantajayite.—See *Halite*, p. 55.

HUASCOLITE, Min., p. 42.—A massive mineral having a bluish gray color is referred to huascolite by *Raimondi* (Min. Pérou, p. 202, 1878). He obtained after deducting 14.50 p. c. gangue: S 27.76, Pb 26.86, Zn 44.50, Fe 0.88 = 100, from the Poderosa mine, Province of Dos de Mayo, Peru. *Domeyko* describes a mineral from Morochocha, Peru, corresponding in composition to $PbS + (Zn, Fe)S$, with Zn = 16.59; another from Coro-Coro, Bolivia, afforded 5 p. c. ZnS (6th App. Min. Chili, p. 17, 1878).

HÜBNERITE, Min., p. 603; App. II., p. 28.—Nevada, containing thallium, *Sandberger*, J. Min., 1877, 508. From Morochocha, Peru, *Raimondi*, Min. Pérou, p. 241, 1878. Occurs at Rabenstein, *Sandberger*, J. Min., 1879, 369. Found by W. P. Jenney, in the Black Hills, Dakota, at the Comstock mine, near Deadwood.

Hullite. *E. T. Hardman*, Proc. Roy. Ir. Acad., II., iii., 161, 1878.

Massive. H. = 2. Color velvet black. Lustre waxy but dull. Analysis, Hardman: SiO_2 , 39.44, Al_2O_3 , 10.35, Fe_2O_3 , 20.72, FeO 3.70, MgO 7.47, CaO 4.48, H_2O 13.62, MnO tr., CO_2 tr. = 99.78. Occurs filling and coating vesicular cavities in the basalt of Carnmoney Hill, near Belfast, Ireland.

Heddle remarks that hullite may be considered as a desiccated chlorophæite, but he also gives the following analysis of a similar mineral from the basalt at Kinkell, in Fifeshire, Scotland: SiO_2 , 38.59, Al_2O_3 , 17.34, Fe_2O_3 (FeO undet.) 15.97, MnO 1.56, CaO 3.94, MgO 8.65, K_2O 0.67, H_2O 13.48 (at 100° 8.04) = 100.20. This he regards as a homogeneous mineral, and believes it to somewhat support the claim of hullite to be considered as an independent species, Trans. Roy. Soc. Edinb., xxix., 89, 1879. [Near delessite; compare also diabantite.]

Huminite. A hydrocarbon from Östmark, in Wermland, Sweden, which, according to Ekman (Efv. Ak. Stockh., 1868, 138), has the composition (ash free): C 67.15, O 29.83, H 2.55, N 0.47, S [0.40] = 100. A similar coal from Gryhytte, Finberget, Sweden, has, according to Helland (Geol. För. Förh., ii., 521, 1875), the composition (ash free): C 67.67, O 28.11, H 3.89, N tr., S 0.33 = 100.

HUMITE, Min., p. 363.—See *Chondrodite*, p. 26; and App. II., p. 28.

Huntillite.—See *Macfarlanite*, p. 71.

HYALITE.—Min., p. 199; App. II., p. 28.

HYALOSIDERITE.—Min., p. 256; App. II., p. 28.

Hyalotekite. *Nordenskiöld*, Geol. För. Förh., iii., 382, 1877.

Massive. Coarsely crystalline. Cleavage easy in two directions, at an angle of approximately 90°; also less easy in a third direction, in the same zone (Des Cloizeaux). H. = 5-5.5. G. = 3.81. Lustre vitreous to greasy. Color white to pearly gray. Transparent in very thin plates. Brittle. Optically biaxial, axes in a plane parallel to the axis of the zone of three cleavages: $2H = 98^\circ-99^\circ$ (red), bisectrix positive (Des Cloizeaux, Bull. Soc. Min., i., 9, 1878). An incomplete analysis gave:

SiO_2	PbO	BaO	CaO	ign.	
39.62	25.30	20.66	7.00	0.82	Al_2O_3 , K_2O , etc., tr.

B. B. fuses to a clear glass, which in R. F. becomes blackened with reduced lead. On charcoal with soda in small amount fuses to a clear glass; with more soda in R. F. gives a lead globule and a coating of lead oxide. In salt of phosphorus dissolves, leaving a skeleton of silica. Insoluble in hydrochloric or sulphuric acids. Occurs sparingly in a grayish-white feldspar, with hedyphane and schefferite, at Långban, Wermland, Sweden. Named from *ὑάλος*, glass, and *τῆμεν*, to melt.

HYDRARGILLITE.—See *Gibbsite*, p. 51

HYDRARGYRITE.—App. II., p. 28 (8).

Hydrocastorite.—See *Petalite*, p. 91.

Hydrocerussite. *Nordenskiöld*, Geol. För. Förh., iii., 381, 1877.

A hydrous lead carbonate (perhaps $2\text{PbCO}_3 + \text{H}_2\text{O}$), occurring sparingly as a coating on native lead, at Långban, Wermland, Sweden. It consists of white, colorless, crystalline plates, showing one perfect cleavage; soft. Soluble in acid with evolution of carbon dioxide. According to Bertrand (*Bull. Soc. Min.*, iv., 87, 1881), the mineral occurs in hexagonal plates, and optically is uniaxial, negative. [Needs further examination.]

HYDROCUPRITE.—App. II., p. 28.

HYDROCYANITE.—App. II., p. 29.

Hydrofluorite. *Scacchi*, Att. Acc. Napoli, vi., 1873 (*Contrib. Min.*, ii., 65). Hydrofluoric acid gas observed at Vesuvius, especially after the eruptions of 1870 and 1872.

Hydrofranklinite. According to the late *W. T. Røepper*, a new hydrous oxide of zinc, manganese, and iron. Occurs in small, very brilliant iron-black regular octahedrons; with octahedral cleavage highly perfect. H. = 4-4.5. G. = 4.06-4.09. From Sterling Hill, N. J. [The original investigation was, unfortunately, never completed.]

HYDROHALITE.—App. II., p. 29.

Hydroilmenite.—See *Menaccanite*, p. 76.

HYDROMAGNESITE.—App. II., p. 29.

Hydroniccite. A name suggested for a doubtful substance conjectured to be a hydrated oxide of nickel, Texas, Penn., *C. U. Shepard*, *Min. Contr.*, 1877.

Hydrophilite.—See *Chlorocalcite*, p. 25.

Hydrorhodonite. *N. Engström*, Geol. För. Förh., ii., 468, 1875.

Massive; crystalline. Cleavage easy in one direction. H. = 5-6. G. = 2.70. Lustre vitreous. Color red-brown. Streak brownish white. Translucent, in thin splinters transparent. Fracture splintery. Analyses:

	SiO ₂	MnO	FeO	MgO	CaO	Li ₂ O	Na ₂ O	H ₂ O	
1.	44.07	30.83	1.04	6.98	3.60	1.23	0.39	11.84	= 99.98.
2.	44.06	31.15	1.00	7.24	3.54	(LiCl, NaCl = 4.80)		11.96.	

Formula $\text{RSiO}_3 + \text{H}_2\text{O}$, or rhodonite plus a molecule of water. Soluble in HCl, with the separation of silica. B. B. fuses easily to an opaque, brownish red bead; reacts for manganese. The powdered mineral becomes black on heating. From Långban, in Wermland, Sweden. [Perhaps simply a hydrated rhodonite.]

Hydrotitanite.—See *Perofskite*, p. 91.

HYGROPHILITE, App. II., p. 29.—Related mineral from Reuschbach, Palatinate, *Gümbel*, *J. Min.*, 1878, 385.

HYPERSTHENE, *Min.*, p. 209; App. II., p. 29.—*Anal.*, Adirondacks, N. Y., *Leeds*, *Amer. Chem.*, March, 1877. Finland, *Öfv. Finsk.*, xvii., 72-3. Arvieu, Arveyron, *Pisanì*, *C. R.* lxxxvi., 1419, 1878. Santorin, *Fougué*, *Bull. Soc. Min.*, i., 46, 1878. Romsås, Askim, *Meinich*, *Hjortdahl*, *Z. Kryst.*, iv., 519, 1880.

Crystallographic and optical description with analyses, Bodenmais, *Becke*, Min. Petr. Mitth., iii., 60, 1880. From Demavend, Persia, in trachyte, *Blaas*, Min. Petr. Mitth., iii., 479, 1881.

HYPOCHLORITE.—Min., p. 392; App. II., p. 30.

ICE, Min., p. 135.—Optical structure, *Koch*, J. Min., 1877, 449. *Bertin*, Ann. Ch. Phys., V., xiii., 283, 1878. *Klocke*, J. Min., 1879, 272; 1881, i., 23.

IDOCRASE.—See *Vesuvianite*, p. 129.

IDROCASTORITE (Hydrocastorite).—See *Petalite*, p. 91.

IGELSTRÖMITE.—See *Pyroaurite*, p. 99.

IHLËITE. *Schrauf*, J. Min., 1877, 252.

Amorphous. Forms an efflorescence on graphite, having a botryoidal or small reniform structure. G. = 1·812. Color orange yellow, becoming pale yellow in dry air. Analyses:

	SO ₃	Al ₂ O ₃ , Fe ₂ O ₃	FeO	CaO	H ₂ O	
1.	38·2	24·5	2·1	...	35·5	= 100·3.
2.	37·4	0·3	26·1	0·4	35·6	= 99·8.
3.	37·2	25·6	1·4	0·3	35·3	= 99·8.

Formula perhaps [Fe₂]S₃O₁₂ + 12aq. = SO₃ 38·96, Fe₂O₃ 25·96, H₂O 35·07. Soluble in cold water. Occurs at the graphite deposits at Mugrau, Bohemia, owing its origin to the decomposition of imbedded crystals of pyrite. Named for Mr. Ihle, superintendent of mines in Mugrau. [Near *coquimbite*.]

ILESITE. *A. F. Wuensch*, Mining Index, Leadville, Colorado, Nov. 5, 1881. In loosely adherent crystalline aggregates, prismatic. Color white. Taste bitter, astringent. Friable. Analysis by M. W. Iles:

SO ₃	MnO	ZnO	FeO	H ₂ O	
35·85	23·18	5·63	4·55	30·18	= 99·39.

This corresponds approximately to RSO₄ + 4aq., which, with R = Mn : Zn : Fe = 5 : 1 : 1, requires : SO₃ 35·63, MnO 22·58, ZnO 5·15, FeO 4·58, H₂O 32·06 = 100. Readily soluble in water. Occurs in a siliceous gangue with the sulphides of iron and zinc (from which it has been formed), in veins 2 to 8 inches wide. Locality in Hall Valley, Park Co., Colorado. Named after Dr. M. W. Iles, of Leadville.

ILMENITE.—See *Menaccanite*, p. 76.

ILMENORUTILE.—See *Rutile*, p. 105.

ILSEMANNITE.—App. I., p. 7.

ILVAITE, Min., p. 296; App. II., p. 30.—Analyses, (1), Elba, *Sipőcz* (Min. Mitth., 1875, 72), an unaltered crystal; (2), *Early*, quoted by Reynolds (Chem. News, xxxvi., 85, 1877), Proc. Roy. Ir. Acad., II., iii., 52, 1877.

	SiO ₂	Fe ₂ O ₃	FeO	MnO	CaO	H ₂ O	
1. G. = 4·037 (4)	29·67	21·26	33·09	0·74	13·33	2·32	= 100·41.
2.	29·93	20·16	31·83	3·02	13·71	0·42,	Al ₂ O ₃ 0·36, MgO 0·30, K ₂ O 0·20, [Na ₂ O 0·29 = 100·22.

Sipőcz makes the water essential, and adopts the formula of Städeler: $R_2[R_2]Si_4O_{18}$, or $H_2Ca_2Fe_4[Fe_2]Si_4O_{18}$; Reynolds neglects the water, and writes: $R_6[R_2]Si_4O_{17}$, or $Ca_2(Fe, Mn)_4[Fe_2]Si_4O_{17}$.

According to Websky, isomorphous with humite, Ber. Ak. Berlin, 1876, 201.

Indianaite.—See *Halloysite*, p. 55.

Iodobromite. *A. von Lasaulx*, J. Min., 1878, 619.

Isometric, in octahedrons with cubic planes. Cleavage octahedral indistinct. G. = 5.713. Color sulphur yellow, sometimes greenish. Sectile. Composition: 2 Ag (Cl, Br) + Ag I = Cl 7.79, Br 17.18, I 14.15, Ag 60.88 = 100. Analysis, Lasaulx (l. c.):

Cl	Br	I	Ag	
7.09	17.30	15.05	59.96	= 99.40.

B. B. gives off bromine vapors and leaves a silver globule. Found in small cavities in ferruginous quartz at the mine "Schöne Aussicht," near Dernbach, Nassau, associated with beudantite, carminite, and probably greenockite.

IODYRITE, Min., p. 117.—Artificial crystals, hemimorphic, *v. Zepharovich*, Z. Kryst., iv., 119, 1879.

Cryst., Dernbach, Nassau, *Seligmann*, Corr. Bl. Nat. Ver. Bonn, xxxvii., 130, 1880.

Occurrence at Caracoles, Chili, *Domeyko*, 6th App. Min. Chili, p. 29, 1878.

IOLITE, Min., p. 299; App. II., p. 30.—Elba, *D'Achiardi*, Att. Acc. Tosc., ii., July 4, 1875 (ZS. G. Ges., xxvi., 462). Pseudomorphs, *Wichmann*, ZS. G. Ges., xxvi., 675, 1874. In Hungarian trachytes, *Szabó*, J. Min., Beil-Bd., i., 302, 1881.

Ionite. *S. Purnell*, Am. J. Sc., III., xvi., 153, August, 1878.

A fossil hydrocarbon found in a more or less impure condition in the lignite of Ione Valley, Amador County, California. Structure firm, earthy. Color brownish yellow. Partially soluble in cold alcohol, largely soluble in ether, completely so in chloroform. A brown tarry oil containing a small quantity of paraffine is separated by dry distillation. Exact chemical nature unknown.

IRIDIUM, Min., p. 12.—Cryst., Ural, *v. Jeremejev*, Verh. Min. Ges. St. Pet., II., xiv., 155, 1879 (Z. Kryst., iii., 437).

IRIDOSMINE, Min., p. 12.—(Neflanskite), *v. Kokscharof*, Min. Russl., vi., 237, 239, 1874.

IRON, Min., p. 15; App. II., p. 30.—The native iron of Ovikaf, Disco Bay, Greenland, discovered by *Nordenskiöld* in 1870 (Öfv. Ak. Stockh., 1870, 1058, and 1871, 1, or Geol. Mag., ix., 1872), and by him regarded as of meteoric origin, has been exhaustively studied both in its geognostic and chemical relations:—See *Nordström*, Öfv. Ak. Stockh., 1871, 453; *Nauckhoff*, ib., Bihang, i., April, 1872 (or Min. Mitth., 1874, 109); *Daubrée*, C. R., lxxiv., 1516, 1872, and lxxv., 240, 1873, and lxxxiv., 63, 1877; *Wöhler*, Gött. Gelehrt. Anzeig., 1872, 197, and J. Min., 1879, 832; *Tschermak*, Min. Mitth., 1874, 165; *Steenstrup*, Ved. Medd. Copenhagen, 1875, Nos. 16-19 (or ZS. G. Ges., xxviii., 225, 1876); *Törnebohm*, Öfv. Ak. Stockh., Bihang, 1878; *Meunier*, C. R., lxxxix., 215, 1879; *J. Lawrence Smith*, Ann. Ch. Phys., V., xvi., 452, 1879. The observations of Steenstrup, and later more particularly those of Törnebohm and Smith make it very certain that the iron is not meteoric but of terrestrial origin.

Iserite.—See *Rutile*, p. 105.

ISOCLASITE.—App. I., p. 7.

ITTNERITE, Min., p. 333.—It is concluded by *van Werwerke* on the basis of a microscopical and chemical examination that ittnerite and skolopsite belong together, and that both

are results of the partial alteration of haüynite (*J. Min.*, 1880, ii., 264). This confirms the conclusion of Rammelsberg (*Syst. Min.*, p. 333, and *Min. Chem.*, 2d ed., p. 459).

IVIGTITE.—App. I., p. 7.

JACOBSITE, App. I., p. 8.—Långban, Wermland, Sweden, anal. by Lindström: Fe₂O₃ 58·39, Mn₂O₃ 6·96, MnO 29·93, MgO 1·68, CaO 0·40, PbO 1·22, P₂O₅ 0·06, insol. 2·17 = 100·81. This corresponds to Mn [Fe₂, Mn₂]O₄; quoted by *Nordenskiöld*, *Geol. För. Förh.*, iii., 384, 1877.

JADEITE, *Min.*, p. 292.—Analyses of related minerals, *Damour*, *Bull. Soc. Min.*, iv., 157, 1881.

See also *Neprite*, p. 84.

JAIPURITE, *Min.*, p. 47 (Syepoorite, Jeypoorite, wrong orthog., Mallet).—According to a recent investigation, by *F. R. Mallet*, of the cobalt minerals of the Khetri mines, Rajputana, India, the simple cobalt sulphide, originally called syepoorite, probably has no existence; the cobalt minerals identified were cobaltite and danaite. *Records Geol. Surv. India*, xiv., pt. 2, 190, 1881.

JALPAITE.—*Min.*, p. 39; App. II., p. 30.

JAMESONITE, *Min.*, p. 90; App. II., p. 30.—Related mineral (heteromorphite) from Arnsberg, Westphalia, anal. corresponding to 7PbS + 4Sb₂S₃, *Pisani*, *C. R.*, lxxxiii., 747, 1876.

Anal. (Sarlay) Wiltan, *Pichler*, *Min. Mitth.*, 1877, 355. Sevier Co., Arkansas, *Dunnington*, *Amer. Assoc.*, 1877, 184. Spain, Province of Huelva, *Genth*, *Am. Ch. Journ.*, i., 325, 1879. Arkansas, *C. E. Wait*, *Trans. Amer. Inst. Min. Eng.*, viii., 51, 1880.

JAROSITE, *Min.*, p. 660.—*Cryst.*, v. *Kokscharof*, *Min. Russl.*, vi., 227, 1874.

Occurrence at the Vulture mine, Arizona, *Silliman*, *Am. J. Sc.*, III., xviii., 73, 1879; anal. (1), *Penfield*, *ib.*, xxi., 160, 1881. Occurrence at the Arrow mine, Chaffee Co., Colorado, and anal. (2), *König*, *Am. Chem. Journ.*, ii., 375, 1881. Occurrence in the province of Cajamarca, Peru, *Ramondi*, *Min. Pérou*, p. 234, 1878.

		SO ₃	Fe ₂ O ₃	K ₂ O	Na ₂ O	H ₂ O	SiO ₂
1.	G. = 3·09	30·42	48·27	8·53	0·28	[11·42]	1·08 = 100.
2.	G. = 3·144	29·33	52·36	7·30	0·90	10·55	.... = 100·44.

The water determined in (1), viz., 12·91, was too high, the result obtained by difference is nearer correct. In (2), the silica has been deducted, and 8·8 p. c. of turgite remains to be rejected. The formula is then K₂[Fe₂]₃S₄O₂₂, 6H₂O = K₂SO₄ + [Fe₂]S₃O₁₂ + 2[Fe₂]H₆O₆.

JAULINGITE, *Min.*, p. 800.—A related resin (C₂₉H₄₃O₂), from Köflach, Styria, for which the name KÖFLACHITE is provisionally suggested by *Dölter*, *J. Min.*, 1880, ii., 152 (ref.).

JEFFERISITE.—*Min.*, p. 494; App. II., p. 30; see also *Vermiculite*, p. 129.

JEFFERSONITE.—*Min.*, p. 215; App. II., p. 30.

Jogynaite.—See *Scorodite*, p. 108.

JORDANITE.—*Min.*, p. 88; App. II., p. 31.—*Cryst.*, *Binnenthal*, *W. J. Lewis*, *Z. Kryst.*, ii., 191, 1878.

JULIANITE.—App. I., p. 8.

KAKOCHLOR.—See *Psilomelane*, p. 98.

KALUSZITE.—App. II., p. 31 (54).

KAOLINITE, Min., p. 473; App. II. p. 31.—Anal., Quenast, Belgium, *de Koninck*, Bull. Ac. Belg., II., xlv., 733, 1877.

Chemical and microscopical discussion of kaolin from the "Bunt Sandstein" of Thuringia, *Herold*, Inaug. Diss. Jena, 1875. Schmid, in an extended discussion on the same subject, names two kinds of crystallites observed by him *mikrovermiculit*, and *mikroschörlit*, the latter he regards as probably tourmaline, ZS. G. Ges., xxviii., 87, 1876.

KĀRARFVEITE.—App. II., p. 32.

KARSTENITE.—Min., p. 621; App. II., p. 31.

Karyinite.—See *Caryinite*, p. 20.

Keatingine.—See *Rhodonite*, p. 104.

KEILHAUITE, Min., p. 387.—Contains scandium, *Cleve*, Öfv. Ak. Stockh., xxxvi., No. 7, p. 3, 1879.

Kelyphite. *Schrauf*, Verh. G. Reichs., 1879, 244. Gray serpentinous coating of pyrope crystals from Kremze, near Budweis, Bohemia. The pyrope has been analyzed by *Scharizer*.

KENNGOTTITE.—See *Miargyrite*, p. 77.

Kentrolite. *Damour* and *vom Rath*, Z. Kryst., v., 32, 1880.

Orthorhombic; axes, *c* (vert.): δ : α = 0.784, 1 : 0.633. Observed planes: *I*, 1, and *i*- $\bar{\lambda}$ small. $I \wedge I = 115^\circ 18'$, $1 \wedge 1$ (terminal) = $87^\circ 29'$ and $125^\circ 32'$. Cleavage: prismatic, distinct. Crystals minute, often grouped in sheaf-like forms resembling stilbite, planes rough, and the prismatic horizontally striated. Also massive. H. = 5. G. = 6.19. Color dark reddish brown, on the surface blackish (*vom Rath*). Analysis, *Damour*:

SiO ₂	MnO ₂	PbO
15.95	24.50 (or Mn ₂ O ₃ 22.26)	59.79 = 100.24.

The state of oxidation of the manganese, and hence the true composition of the mineral, is left in doubt; on the first supposition it is expressed $Pb\overset{IV}{Mn}SiO_3$, which requires: SiO₂ 16.21, MnO₂ 23.52, PbO 60.27 = 100; on the second it is $Pb_2[Mn_2]Si_2O_3$, which requires: SiO₂ 16.53, Mn₂O₃ 21.83, PbO 61.59 = 100. [The latter formula is the more probable one; see *Melanotekite*, p. 75.] B. B. on charcoal gives a lead coating and with soda a globule of lead. In a salt of phosphorus bead dissolves and gives in R. F. a slight yellowish color, after the addition of saltpeter becomes bright violet. Dissolves in part in dilute sulphuric acid with the separation of manganese oxide and silica. With HCl chlorine is disengaged. From southern Chili, exact locality unknown. Occurs with quartz, barite, apatite. Named from *κέντρον*, *spike*. Websky calls attention to the fact that the angles of kentrolite agree very closely with those of descloizite (Z. Kryst., v., 552).

KERRITE.—App., p. 31.

KIESERITE.—Min., p. 641; App. II., p. 31.

KILLINITE.—See *Spodumene*, p. 112.

KJERULFINE, App. II., p. 31.—See *Wagnerite*, p. 130.

KLAPROTHOLITE.—App. I., p. 8.

KLINOCROCITE.—See *Clinocrocite*, p. 28.

KLINOPHLEITE.—See *Clinophæite*, p. 28.

KOCHELITE.—App. I., p. 8.

Köflachite.—See *Jaulingite*, p. 64.

KÖHLERITE.—App. II., p. 31.

KOLLOPHAN.—App. I., p. 9.

KONGSBERGITE, App. II., p. 32.—See *Amalgam*, p. 4.

KOPPITE.—App. II., p. 32.

KORARFVEITE.—App. II., p. 32.

KÖTTIGITE, Min., p. 561.—Cryst., isomorphous with vivianite, *Groth*, Min.-Samml. Strassburg, p. 166, 1878.

KRAURITE.—See *Dufrenite*, p. 39.

Krennerite. BUNSENIN, *Krenner*, Termesz. Füzetek, 1877 (Wied. Ann., i., 637). KRENNERITE, *vom Rath*, Ber. Ak. Berlin, 1877, 292 (Z. Kryst., i., 614, 1877). *Schrauf*, ib., ii., 235, 1878.

Orthorhombic (monoclinic? *Schrauf*). Axes: c (vert.): b : a = 50445 : 1 : 94071. Observed planes: O , i - \bar{i} , i - \bar{i} , I , i - $\bar{2}$, i - $\bar{3}$, i - $\bar{5}$, i - $\bar{8}$, 1, 2- $\bar{1}$, 3- $\bar{1}$, 1- $\bar{1}$, $\frac{1}{2}$ - $\bar{1}$, 1- $\bar{1}$, 1- $\bar{5}$, $\frac{3}{2}$ - $\bar{3}$. $I \wedge I = 93^\circ 30'$; $O \wedge 1-\bar{1} = 151^\circ 48'$; $O \wedge 1-\bar{1} = 153^\circ 14'$; $O \wedge 1 = 143^\circ 39'$. In vertically striated prismatic crystals. Cleavage: basal perfect (v. *Rath*). Lustre metallic, brilliant. Color silver white to brass yellow. Opaque. Brittle.

Contains gold and tellurium, with a little silver and copper, but exact composition not yet determined; *Schrauf* obtained from an approximate blowpipe analysis, Au + Ag (Pb?) 52, or Au 31. B. B. decrepitates violently. Found at Nagyag, Transylvania, associated with quartz and pyrite. Related to sylvanite in the angles of two zones, but different in others. Also related in composition to calaverite.

This is the mineral, according to *Krenner* and *Schrauf*, which has formerly gone by the names *gelberz*, *weissstellur*, *müllerine*, etc., see Min., p. 81.

As the name *bunsenite* has been accepted for the nickel protoxide from *Johanngeorgenstadt*, *vom Rath* has given this mineral the name *krennerite* from the original discoverer.

Krönnkite. *I. Domeyko*, 5th Appendix Min. Chili, 1876; also 3d ed. Min. Chili, p. 250, 1879.

Triclinic (?). In irregular prismatic crystalline masses with coarsely fibrous structure. Cleavage distinct parallel to an edge of the prism. $G. = 2.5$. Lustre vitreous. Color azure blue, changing somewhat on exposure to the air. Composition: $\text{CuSO}_4 + \text{Na}_2\text{SO}_4 + 2\text{aq}$ = copper sulphate 47.23, sodium sulphate 42.09, water 10.68 = 100. Analysis by *Krönnke*: CuSO_4 46.28, Na_2SO_4 42.95, H_2O 10.77 = 100. Perfectly soluble in water. Found in the copper mines near Calama, on the road from Cabija to Potosi, Bolivia.

Krugite.—See *Polyhalite*, p. 96.

LABRADORITE, Min., p. 341; App. II., p. 32.—Anal., Adirondacks, N. Y., *Leeds*, Amer. Ch., March, 1877. *Arvieu*, *Arveyron*, *Pisani*, C. R., lxxxvi., 1420, 1878. *Klement*, Min. Petr. Mitth., i., 366, 1878; *Schuster*, ib., p. 367.

See also *Feldspar Group*, p. 45.

LANARKITE, Min., p. 628; App. II., p. 33.—Cryst. description, with correction of previously accepted angles, *Schrauf*, Z. Kryst., i., 31, 1877.

LANGITE.—Min., p. 635; App. II., p. 33.

LAPIS LAZULI.—Min., p. 334; App. II., p. 33.

LAUMONTITE, Min., p. 399; App. II., p. 33.—**Anal.**, New South Wales, *Liversidge*, Min. Mag., i., 54, 1876. Monte Catini, *Bechi*, Accad. Linc. Trans., III., iii., 114, 1879.

Analysis by *A. Smita* (Min. Mitth., 1877, 268), of LEONHARDITE from the Floitenthal (see *Brezina*, ib., 1877, 98) gave: SiO₂ 52.92, Al₂O₃ 22.44, CaO 12.23, H₂O 12.38 = 99.97, for material dried over sulphuric acid, and SiO₂ 60.15, Al₂O₃ 25.91, CaO 14.19 = 100.25 for ignited material. The first corresponds with the previously accepted formula: Si₄[Al₂]CaH₆O₁₅, which, however, expresses the composition of the mineral only after it has lost in dry air, or at 100°, a part of its water. *Smita* confirms the conclusion that leonhardtite is to be referred to laumontite, differing from it only in having lost a part of the water which goes off at 100°.

LAURITE, Min., p. 74; App. II., p. 33.—Artificially prepared, *St. Claire Deville* and *Debray*, Bull. Soc. Min., ii., 185, 1879.

Lautite. *Frenzel*, Min. Petr. Mitth., iii., 515; iv., 97, 1881.

In small brilliant crystals, short prismatic, with *I*, *i*-*γ* and *O*; orthorhombic. Generally massive; compact. Columnar to fine fibrous, radiated, also fine granular. H. = 3-3.5. G. = 4.96. Lustre metallic. Color iron black. Streak black. Opaque. Not brittle.

Analyses, *Frenzel* :

	S	As	Sb	Ag	Cu	
1.	18.00	42.06	.....	11.74	27.60	= 99.40.
2.	17.60	41.06	.....	11.62	28.29	= 98.57.
3.	18.57	42.60	0.58	3.03	33.54, Fe 0.44	= 98.76.

The iron in (3) is due to chalcopyrite; another determination of the silver gave 7.78 p. c. Formula deduced CuAsS [see below], with Ag replacing in part the Cu, this requires: S 18.78, As 44.01, Cu 37.21 = 100. B. B. decrepitates violently; fuses easily, giving off arsenical fumes. In the closed tube yields an arsenical mirror. Soluble in nitric acid; gives with hydrochloric acid a silver chloride precipitate. Found at *Lauta*, near *Marienberg*, Saxony; accompanied by metallic arsenic, ruby silver, tetrahedrite, chalcopyrite, galenite, and barite. [A homogeneous mineral? May it not contain metallic arsenic?]

LAVENDULAN, Min., p. 560.—**Anal.**, Chili, *Goldsmith*, Proc. Ac. Nat. Sc. Philad., p. 192, 1877.

LAVROFFITE.—Min., p. 216; App. II., p. 33.

Lawrencite. *Daubrée*, C. R., lxxxiv., 66, Jan., 1877.

Iron protochloride, shown by *Daubrée* to be present in the Greenland native iron. Named after Dr. J. Lawrence Smith, of Louisville, Ky., who detected the same substance in the meteoric iron of *Tazewell*. *Daubrée* also uses the name STAGMATITE (from *στάγμα*, drop).

LAXMANNITE.—App. I., p. 9.

LAZULITE, Min., p. 572; App. II., p. 33.—**Anal.**, discussion of formula, *Zermatt*, *Gamper*, Jahrb. G. Reichs., 1878, 611. Canada, *Hoffmann*, Geol. Canada, Rep., 1879-80 (Am. J. Sc., III., xxi., 410).

LEAD, Min., p. 17; App. II., p. 33.—Russia, occurrence, *v. Kokscharof*, Min. Russl., vi., 236. Huancavelica, Peru, *Raimondi*, Min. Pérou, p. 145, 1878.

LEADHILLITE, Min., p. 624; App. II., p. 33.—*Laspeyres* (Z. Kryst., i., 193, 1877) finally concludes that his supposed species, MAXITE (App. II., p. 38), is really identical with lead-

hillite. The crystalline form is monoclinic, according to him, with $\beta = 89^\circ 48'$, and the composition is expressed by the empirical formula $H_{10}Pb_{14}C_9S_5O_{56}$, which requires SO_3 8.17, CO_2 8.08, PbO 81.91, H_2O 1.84 = 100 (see also *J. pr. Ch.*, xi., 26, 1874; xii., 347, 1876; xiii., 370, 1876). The extremely complex character of the formula makes it somewhat improbable.

Bertrand (C. R., lxxxvi., 348, 1878) describes leadhillite from Matlock, Derbyshire, with $2E = 72^\circ$ yellow (Sardinia and Scotch crystals have $2E = 21^\circ$); the angle diminishes with rise in temperature, and finally $2E = 66^\circ$ at 250° ; above this point the crystals fly to pieces. As bearing upon the question of the independent character of susannite, *Bertrand* describes crystals from Leadhills, in which he finds gray colored spots with $2E = 21^\circ$, and green colored spots which are uniaxial. The species leadhillite and susannite are probably identical.

Leidyite. *König*, Proc. Acad. Nat. Sc. Philad., 1878, 84.

In verruciform incrustations, consisting of fine scales with silky lustre; also stalactitic; crystalline (?). $H. = 1-2$. Lustre resinous. Color grass-, blue-, or olive-green. Streak white. Analysis:

SiO ₂	Al ₂ O ₃	FeO	MgO	CaO	H ₂ O	
51.41	16.82	8.50	3.07	3.15	17.08	= 100.03.

The formula calculated by the author is $R_2[Al_2]Si_5O_{15} + 5aq$, with $R = Fe, Ca, Mg, H_2$. B. B. fuses with intumescence to a light yellow green glass. In the closed tube gives off water and becomes brown. Soluble readily in HCl, with partial gelatinization; after ignition insoluble. Found with grossular garnet, zoisite, and quartz, at Leipersville, Delaware Co., Penn. Named after Dr. Joseph Leidy, of Philadelphia.

LEONHARDITE.—See *Laumontite*, p. 67.

LEPIDOLITE.—Min., p. 314; App. II., p. 33.—See *Mica Group*, p. 77.

Lepidophæite.—See *Wad*, p. 130.

LESLEYITE.—App. I., p. 18.

LETTESOMITE, Min., p. 666.—Anal., La Garonne, Dept. du Var, *Pisani*, C. R., lxxxvi. 1418, 1878. Optical characters investigated, *Bertrand*, Bull. Soc. Min., iv., 11, 1881.

LEUCHTENBERGITE, Min., p. 500; App. II., p. 34.—Microscopic examination, *v. Leuchtenberg*, Bull. Ac. St. Pet., xxi., 509, 1876.

LEUCITE, Min., p. 334; App. II., p. 34.—The question as to the true crystalline system of leucite has been discussed, as follows: *Hirschwald*, Min. Mitth., 1875, 227; *Tschermak*, Min. Mitth., 1876, 66 (anal. by *Berwerth*); *vom Rath*, J. Min., 1876, 281, 403; *Hirschwald*, J. Min., 1876, 519, 733; *Bammhauer*, Z. Kryst., i., 257, 1877; *Hirschwald*, Min. Petr. Mitth., i., 85, 1878; *Bammhauer*, Min. Petr. Mitth., i., 287, 1878; *Groth*, Z. Kryst., v., 264, 1880; *Weisbach*, J. Min., 1880, i., 143; also *Mallard*, Ann. Min., VII., x., 79, 1876. *Hirschwald* maintains that the species is, in fact, isometric, with polysynthetic structure. This view is opposed by *Bammhauer*, *vom Rath*, and *Groth*, and the results of a series of experiments on the etching of the crystalline faces seem to prove its tetragonal nature. *Mallard* regards leucite as pseudo-isometric, referring it to the orthorhombic system, and later, *Weisbach*, on the basis of a series of measurements by *Treptow*, has reached a similar conclusion.

Fouqué and *Lévy* have succeeded in obtaining artificial crystals of leucite (C. R., lxxxvii., 961, 1878, and Bull. Soc. Min., iii., 118, 1880); and *Hautefeuille* (C. R., xc., 313, 378, 1880) has formed an iron leucite, containing iron in place of the alumina. In both cases the same twinning is observed, and the same optical characters as in natural crystals.

Analyses by *Berwerth*, Acquacetosa, near Rome (Min. Mitth., 1876, 66); *Schulze*, Albani Mts., J. Min., 1880, ii., 114. Occurrence on the island of Bawean, Dutch East Indies, *Vogelsang-Zirkel*, J. Min., 1875, 175.

Leucochalcite. *Sandberger; Petersen, J. Min., 1881, i., 263.*

In very slender, needle-like crystals. Nearly white, with tinge of green. Lustre silky. Analysis: As_2O_3 [37·89], P_2O_5 1·60, CuO 47·10, CaO 1·56, MgO 2·28, ign. 9·57 = 100; corresponding to $Cu_4As_2O_8 + 3H_2O$, or $Cu_3As_2O_8 + CuH_2O_2 + 2aq$, which requires: As_2O_3 42·75, CuO 47·21, H_2O 10·04 = 100. Becomes first green on ignition, and finally fuses to a black glass. Occurs as a delicate coating with malachite and calcite. Wilhemine mine in the Spessart. [A more complete description is to be desired; the mineral is apparently an arsenical galilite.]

Leucomanganite. *Sandberger, J. Min., 1879, 370.* Announced as a snow-white mineral, in broad foliated-radiated aggregates. B. B. becomes brownish black, and fuses easily. Contains MnO , FeO , alkalis and water. From Rabenstein, near Zwiessel. [Needs further examination. Is it related to fairfieldite?]

LEUCOPHANITE, Min., p. 260; App. II., p. 34.—*Bertrand* (Phil. Mag., V., iii., 357, 1877) concludes on optical grounds that leucophanite is to be considered either as monoclinic or hemihedral orthorhombic. *Groth* (Z. Kryst., ii., 199, 1878) proves that the crystals are really monoclinic, and deduces the axial relations, c (vert.): $b : a = 1·054 : 1 : 1·061$; $\beta = 90^\circ$ approx. *Groth* describes twins and fourlings analogous to harmotome.

Rammelsberg (ZS. G. Ges., xxviii., 57, 1876) publishes some new analyses, and deduces the formula: $R_2Si_4O_{13} + 6NaF$ with $R = Be$: $Ca = 1 : 1$; this requires: SiO_2 49·35, BeO 11·16, CaO 24·68, Na_2O 10·93, F 6·69 = 102·81.

LEUCOPYRITE.—Min., p. 77; App. II., p. 34.

Leucoxene.—See *Titanomorphite*, p. 122.

Leucotile. *Hare*, Inaug. Diss. Breslau, 1879 (Z. Kryst., iv., 295).

In fibres irregularly grouped on serpentine. Cleavable, parallel and perpendicular to the longitudinal direction; optically orthorhombic (?). Lustre silky. Color green. Analysis:

SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	H_2O	
28·98	6·99	8·16	29·78	7·37	1·32	tr.	17·29	= 99·89.

This corresponds nearly to $R_2[R_2]Si_4O_{10}, 8H_2O$. Easily soluble in HCl and H_2SO_4 . B. fuses and becomes slightly yellow, and yellowish brown. From Reichenstein, Silesia.

Leviglianite.—See *Onofrite*, p. 86.

LEVYNITE.—Min., p. 431; App. II., p. 34. See also *Chabazite*, p. 22.

LIBETHENITE, Min., p. 563.—Cryst., pseudo-orthorhombic (monoclinic), according to *Schrauf*, Z. Kryst., iv., 19, 1879.

Made artificially, *Friedel* and *Sarasin*, Bull. Soc. Min., ii., 157, 1879.

LIEVRITE.—See *Ivaite*, p. 62.

LIMBACHITE.—App. II., p. 34.

LIMBILITE.—Min., p. 258; App. II., p. 34.

LIMONITE.—Min., p. 172; App. II., p. 34.

LINARITE, Min., p. 663; App. II., p. 34.—Cryst., *Erzberg, v. Zepharovich*, Lotos, Dec., 1874.

Argentine Republic, anal., *Frenzel*, J. Min., 1875, 675; cryst., *v. Rath*, Z. Kryst., iv., 426, 1880.

Anal., State of Jalisco, Mexico, *Barcena*, Naturaleza, iv., 55, 1877.

LINNÆITE, Min., p. 68.—Analyses, P. T. Cleve (Geol. För. Förh., i., 125, 1872), 1, Bastnäs, 2, Gladhammar :

	S	Co	Ni	Cu	Fe	
1. Bastnäs, G. = 4·755.	41·83	44·92	0·19	8·2	4·19	= 99·35.
2. Gladhammar, G. = 4·825.	42·19	39·33	12·33	2·28	4·29	= 100·42.

Both correspond closely to the formula $2RS + RS_2$, or RS, R_2S_3 .

Lintonite.—See *Thomsonite*, p. 121.

Lionite.—See *Tellurium*, p. 119.

Liskeardite. *Maskelyne*, Nature, Aug. 15, 1878.

Massive ; in thin incrusting layers, with uniform fibrous structure. Color white, with a slight blue or greenish-blue tint. Composition stated to be $[R_2]_3As_2O_{14}, 16H_2O$, with $[R_2] = [Al_2]$ and some $[Fe_2]$, according to an analysis by Dr. Flight (not published) Liskeard, Cornwall. An arsenical evansite, Min., p. 585. [A more complete description is to be desired.]

Lithiophilite.—See *Triphylite*, p. 124.

LITHIOPHORITE, App. I., p. 9.—See *Psilomelane*, p. 98.

Litidionite (Lithidionite). *E. Scacchi*, Rend. Accad. Napoli, Dec., 1880.

Blue lapilli, found at Vesuvius in 1873, 7 to 25 mm. in diameter, were found to consist of a white earthy substance, with a glassy blue crust. Of the latter, H. = 5-6, G. = 2·535. The mean of two analyses gave, after being washed: SiO_2 71·57, CuO 6·49, FeO 4·02, K_2O 10·92, Na_2O 6·78 = 99·78. Slightly attacked by HCl; fuses very easily (the white nucleus, consisting of augite, olivine, etc., is infusible). The author, on the ground of the fusibility, regards the substance as a mixture of quartz and the carbonates of potassium and sodium. [The name, obviously, does not belong to a definite species, why it was given does not appear.]

LIVINGSTONITE, App. II., p. 35.—Analysis by *F. P. Venable* (Chem. News, xl., 186, 1879), after deducting impurities: (3) S 23·73, Sb 53·75, Hg 22·52 = 100, for which the formula $HgS + 2Sb_2S_3$ is given (but Groth suggests $Hg_2S + 4Sb_2S_3$, Z. Kryst., vi., 97). Anal. by Barcena : S 22·97, Sb 53·12, Hg 20·00, gangue and loss 3·91 = 100, *Naturaleza*, iv., 268, 1879. From Guadalcázar, Mexico, anal. by *Page*, Ch. News, xlii., 195, 1880.

Made artificially, *Baker*, Ch. News, xlii., 196, 1880.

LÖLLINGITE, Min., p. 76 ; App. II., pp., 35, 34.—Anal. (sättersbergite, $FeAs_2$), Brevig, Norway, *Nordenskiöld*, Geol. För. Förh., ii., 242, 1875. Monte Challanches, Dauphiny, in crystals, *Frenzel*, J. Min., 1875, 677. In serpentine of Reichenstein, Silesia, *Hare*, Z. Kryst., iv., 295.

Louisite. *Honeymann*, Proc. Nova Scotia Inst. Nat. Sc., v., 15, 1878.

A transparent, glassy, leek green mineral; streak white; fracture splintery. H. = 6·5. G. = 2·41. Gelatinizes with HCl. An analysis by H. Louis gave : SiO_2 63·74, Al_2O_3 0·57, FeO 1·25, MnO tr., CaO 17·27, MgO 0·38, K_2O 3·38, Na_2O 0·08, H_2O 12·96 = 99·63. [Needs further examination; free silica is very probably present.]

Luckite.—See *Melanterite*, p. 76.

Ludlamite. *N. Story-Maskelyne* and *F. Field*, Phil. Mag., V., iii., 52, 135, 525, 1877.

Monoclinic. Axes, c (vert.) : b : a = 1·9820 : 1 : 2·2527. $\beta = 79^\circ 27'$. Observed planes : $O, i-i, i-i, I, 1, -1, -\frac{1}{2}, 1-i, -2-i, 1-i, 2-i, O \wedge i-i = 100^\circ 33', O \wedge 1-i = 117^\circ 10'; I \wedge I = 131^\circ 23'; O \wedge -1 = 118^\circ 35'. O \wedge 1 = 111^\circ 29'$. O and 1 striated parallel to intersection-edge. Cleavage : O highly perfect; $i-i$ distinct. Optic-axial plane, the clinodiagonal. Acute bisectrix positive, inclined $67^\circ 5'$ to the vertical axis in the acute angle of the

axes *ca*. Axial angles : $2H_a = 97^\circ 50'$, $2H_o = 119^\circ$, and hence $2V = 82^\circ 22'$. Dispersion of the bisectrices almost zero, of the axes small $\rho > \nu$.

H. = 3-4. G. = 3.12. Lustre brilliant. Color bright green. Streak greenish white. Transparent. Analysis (mean of several) :

P_2O_5	FeO	H_2O	
30.11	52.76	16.98	= 99.85.

This corresponds to $Fe_3P_4O_{17}, 9H_2O$ (or $H_2Fe_3P_4O_{18} + 8aq$) = P_2O_5 29.89, FeO 53.06, H_2O 17.05 = 100. B. B. colors the flame pale green, and leaves a black residue. In the closed tube decrepitates violently, becomes dark blue, and gives off water. Soluble in dilute hydrochloric and sulphuric acids.

Occurs with siderite, vivianite, pyrite, at the Wheal Jane mine, near Truro, Cornwall. Named after Mr. Ludlam, of London.

LUDWIGITE.—App. II., p. 35.

LÜNEBURGITE.—App. I., p. 10.

LUNNITE.—See *Pseudomalachite*, p. 97.

LUZONITE, App. II., p. 35.—See *Clarite*, p. 27.

Macfarlanite. The occurrence at Silver Islet, Lake Superior, with the metallic silver, of thin plates and grains of a reddish-brown sectile mineral, containing As, Ag, Co, Ni, and supposed to be new, was described by *T. Macfarlane* in 1870 (Can. Nat., Feb. 1). To the granular ore, or mixture of reddish-colored grains with other minerals, the name MACFARLANITE was given, later, by Major Sibley (quoted by *Macfarlane*, Trans. Amer. Inst. Min. Eng., viii., 236, 1889; see also *Courtis*, Eng. Min. J., xxvii., March 29, 1879). In 1879 *Wurtz* described two supposed new minerals from Silver Islet, HUNTILITE (Eng. Min. J., xxvii., 55, 1879) and ANIMIKITE (ib., p. 124). His descriptions are as follows :

HUNTILITE.—In two varieties : (A) of a dark gray or more commonly black color; dull, amorphous, porous, and fragmentary; (B) apparently crystalline; one cleavage direction; bright slate color, and occurs imbedded in calcite. (A) is the more common. Semi-malleable. H. less than 2.5. G. = 7.47 (A), 6.27 (B), after deduction of impurities. Analyses :

	As	Sb	S	Ag	Hg	Co	Ni	Fe	Zn	H_2O	gangue.
A	21.10	3.33	0.78	59.00	1.04	3.92	1.96	3.06	2.42	0.19	3.23* = 100.03.
B	23.99	4.25	1.81	44.67	1.11	7.33	2.11	8.53	3.05	0.33	1.65* = 98.83.

* (A) Silicate 0.88, calcite 2.35; (B) do. 0.55 and 1.10.

The author proposes to subtract the Hg as amalgam, and S as pyrite, and then calculating the remaining metals as Ag ($R = 2R$), he obtains the ratio of $R : As (+ Sb) = 2.90 : 1$ for A, and $2.99 : 1$ for B. On the basis of this, the formula Ag_3As is assumed as representing the composition. Named after Dr. T. Sterry Hunt. [No value can be attached to the formula deduced (see below), for most of the metals thus taken together are present, only as impurities. Compare Arsenargentite, p. 9.]

ANIMIKITE.—Occurs as an incrustation on huntilite, also in isolated slabs or plates. Structure fine-granular, crypto-crystalline. G. = 9.45. Color white to grayish white. Fracture semi-conchoidal or granular. Somewhat sectile. An analysis yielded :

Sb	As	S	Ag	Hg	Co	Ni	Fe	Zn	gangue.
11.18	0.35	1.49	77.58	0.99	2.10	1.90	1.68	0.36	1.68 = 99.31.

From the Silver Islet mine, Lake Superior. Named from "animikie," *thunder*, whence Thunder Bay. The formula Ag_3Sb is proposed.

The complex relations of the above minerals and mineral mixtures has been well investigated by *Macfarlane* (l. c.). The granular ore was found to be made up of reddish-brown metallic grains, when polished looking like burnished nickel, with an undetermined black mineral, niccolite, galena, calcite, and quartz. The ore, pulverized and freed from all brittle materials by washing, yielded 75 to 84 p. c. silver; the grains finally obtained by repeated trituration and sifting had a dark gray color, and gave 92 p. c. silver; on solution

in dilute nitric acid these grains yielded: Ag 93.54, Ni 1.58, As 2.15, Sb 0.36, insol. 2.37 = 100. The insoluble portion (2.37 p. c.) assayed 17.46 p. c. silver.

A quantity of the original metallic grains were acted upon by three successive portions of very dilute nitric acid. The results were:

	Ag	Hg	Ni	As	Sb		
1.	37.64	0.65	4.66	6.40	0.17	=	49.52.
2.	33.69	0.10	1.22	....	0.06	=	35.07.
3.	5.40	....	tr.	....	tr.	=	5.40.

There remained 6.20 p. c. insol. (quartz, etc.), and 3.77 p. c. of a black mineral washed from the quartz, containing 24.8 p. c. Ag, also Sb, S, Pb, Co, Ni. The author closes by stating very justly, that further investigation is needed to determine the character of the various minerals present.

König (Proc. Acad. Nat. Sc. Philad., 1877, 276) has analyzed a similar mineral mixture from Silver Islet: As 10.56, Sb tr., S 1.81, PbS 38.13, Ag 32.68, Ni, Co 8.96, Fe 0.35, quartz 6.00, CaCO₃ 1.20 = 99.74. He regards the nickel and arsenic as combined and forming niccolite, which exists mixed with galenite, argentite, and probably a basic silver arsenide.

[It would appear from the above, that the true nature of the individual minerals present in the Silver Islet ores is still to be determined, but that there is probably present a silver arsenide (*huntite*), and perhaps also a silver antimonide (*animikite*) allied to dyscrasite.]

MACONITE.—App. II., p. 36.

MAGNESITE, Min., p. 685; App. II., p. 36.—Massive var. from Elmen, Eastern Alps (anal. by Lehmayr), *Gümbel*, Verh. G. Reichs., 1880, 276.

MAGNETITE, Min., p. 149; App. II., p. 36.—**Cryst.**, Vesuvius, *Scacchi*, Contrib. Min., ii., 3. Albani Mts., Latium, *Sella*, Z. Kryst., i., 230, 1877. Binnenthal, with implanted rutile crystals in parallel position, *Seligmann*, Z. Kryst., i., 340; do. with hematite, same locality, *Bücking*, ib., i., 575. Jerofeief (Verh. Min. Ges. St. Pet., II., xvii., 24), Min. Russl., viii., 226, 1881.

Coercive force, *Holz*, Wied. Ann., v., 169, 1878.

Anal. Kaiserstuhl (4.08 p. c. TiO₂), *Knop*, Z. Kryst., i., 64, 1877. Magnet Cove (3.25 p. c. TiO₂), *König*, Pr. Am. Ac. Nat. Sc. Philad., 1877, 293. Kristianstad, Sweden (by Nordström, 6.01 p. c. TiO₂), *Karlsson*, Geol. För. Förh., i., 14, 1872.

With melanite on trap, East Rock, New Haven, *E. S. Dana*, Am. J. Sc., III., xiv., 217, 1877.

MAGNOCHROMITE.—App. II., p. 36.

Magnolite. *F. A. Genth*, Amer. Phil. Soc. Phil., xvii., 118, 1877.

In radiating tufts of very minute acicular or capillary crystals. Color white. Lustre silky. Contains mercury and tellurium, and composition inferred to be Hg₂TeO₄. Blackened by ammonia. A decomposition product of coloradoite, found in the upper part of the Keystone mine, Magnolia District, Colorado. [Needs further examination.]

MALACHITE.—Min., p. 715; App. II., p. 37.

MALDONITE.—App. I., p. 10.

Malinofskite.—See *Tetrahedrite*, p. 120.

Mallardite. *Carnot*, Bull. Soc. Min., ii., 117, 1879.

In crystalline masses with fine fibrous structure; probably monoclinic (*Mallard*, ib., p. 119). Colorless. Analyses, 1, Rioult; 2, Carnot:

	SO ₃	MnO	FeO	MgO	CaO	H ₂ O	Insol.	
1.	26.0	20.9	0.3	1.2	0.8	36.8	14.0	= 100.2.
2.	29.0	23.6	...	0.6	0.7	44.5	1.6	= 99.8.

This corresponds closely to the formula: $MnSO_4 + 7aq$, which brings it into the same group with melanterite, Min., p. 646. Easily soluble in water. Changes rapidly on exposure; effloresces, becomes opaque, and finally pulverulent. Is decomposed by strong heating, losing the sulphuric acid and water, and leaving a reddish-brown residue. Cannot be obtained from a solution of manganese sulphate at $15^\circ C$. the salt, $MnSO_4 + 5aq$ in triclinic crystals; but at a temperature of $6^\circ C$. he obtained monoclinic crystals with the composition, $MnSO_4 + 7aq$.

Occurs in a gray clay-like gang stone, with quartz sand and barite. From the silver mine "Lucky Boy," south of Salt Lake, near Butterfield Cañon, Utah.

MANCINITE.—According to Uzielli (Trans. Accad. Linc., III., i., 108, 1877), the mineral called mancinite is not, as supposed, from the hill Mancino, near Leghorn, nor is it a zinc trisilicate, *Jacquot* (Ann. Min. III., xix., 703, 1841).

MANGANITE, Min., p. 170.—**Cryst.**, monograph (Ilefeld), showing 4 types of forms with new planes, twins, etc., the crystals holohedrally developed, *Groth*, Min.-Samml. Strassburg, p. 79, 1878. *Sadebeck*, ZS. G. Ges., xxxi., 206, 1879.

Anal., Långban, Sweden, *Blomstrand*, Geol. Förr. Förrh., ii., 183, 1874.

MANGANOPHYLLITE, App. II., p. 37.—Found at Jacobsberg and Långban, Wermland, Sweden, *Sjögren*, Geol. Förr. Förrh., i., 64, 1872.

Manganosiderite.—See *Rhodochrosite*, p. 103.

Manganosite. *Blomstrand*, Geol. Förr. Förrh., ii., 179, 1874; iii., 123, 1876. *Sjögren*, ii., 531; iii., 181, 1876; iv., 158, 1878.

Isometric. In minute crystals, showing the octahedron and dodecahedron, rarely the cube. Cleavage cubic. Isotropic. H. = 5-6. G. = 5.18. Lustre vitreous. Color emerald green on the fresh fracture, becoming black on exposure to the air. Analysis, *Blomstrand*, ib., ii., 182:

	MnO	FeO	MgO	CaO	
(2)	98.04	0.42	1.71	0.16	= 100.33.

Formula: MnO , and hence isomorphous with periclasite. Dissolves with difficulty in strong nitric acid, forming a colorless solution. Occurs with pyrochroite and manganite, in a manganiferous dolomite (anal.: $CaCO_3$ 56.47, $MnCO_3$ 30.10, $MgCO_3$ 13.56, $FeCO_3$ 0.18 = 100.31, *Blomstrand*) at Långban, Wermland; also in calcite, brucite, or dolomite, with hausmannite, pyrochroite, garnet, etc., at the Mossgrufva, Nordmark, Sweden.

Mangantantalite.—See *Tantalite*, p. 118.

MARCASITE, Min., p. 75; App. II., p. 37.—**Cryst.**, twins described, etc., *Groth*, Min.-Samml. Strassburg, p. 38, 1878. Cryst. association with hematite, *Sadebeck*, Pogg. Ann., Erg.-Bd., viii., 625.

MARCYLITE, Min., p. 137.—*Raimondi* describes a mineral from the Cerro Verde, between Islay and Arequipa, Peru, which he concludes to be a mixture of a hydrated oxysulphide of copper, marcyllite, with cuprite and atacamite. From the hacienda d'Ocucaje, province of Ica, he mentions another consisting of marcyllite, atacamite, melaconite, and limonite, Min: Pérou, pp. 93, 101, 1878. [It has never been shown that the original marcyllite was really a distinct species, and the Peruvian mineral seems to be no less uncertain.]

MARGARITE, Min., p. 506; App. II., p. 37.—See also App. III., *Mica Group*, p. 77, and *Clintonite Group*, p. 28.

MARIPOSITE.—App. II., p. 37.

Marmaircite. *N. O. Holst*, Geol. För. Förh., ii., 530, 1875.

In very fine crystalline needles, monoclinic (?). H. = 5. G. = 3·07. Color pale yellow. Powder white. Transparent. Analysis (mean of several):

SiO ₂	FeO	MnO	MgO	CaO	K ₂ O	Na ₂ O	ign.
56·27	2·03	4·86	21·36	6·33	1·89	5·94	0·90 = 99·58.

Formula approximately RSiO₃ (Q. ratio for R:Si = 13·75:30·02). B. B. fuses with some difficulty to an opaque bead. Not attacked by acids. Occurs with schefferite in a brownish manganesian limestone (containing 6·56 MnO, and 1·35 PbO), at Långban, in Wermland, Sweden. Named from *μαρμαίρω*, to *glisten*. [Very near enstatite, except that it contains alkalis.]

MASCAGNITE, Min., p. 635.—In guano from the Guañape Iles, *Raimondi*, Min. Pérou, p. 32, 1878.

MASKELYNITE.—App. II., p. 37.

MASSICOT, Min., p. 136.—Occurrence, Cerro de Caracoles, Bolivia, *Domeyko*, 6th App. Min. Chili, p. 15, 1878.

MATLOCKITE, Min., p. 119.—**Anal.**, Montagne de Challacollo, Tarapaca, Peru, *Raimondi*, Min. Pérou, p. 170, 1878.

Matricite. *N. O. Holst*, Geol. För. Förh., ii., 528, 1875.

In crystalline masses with concentric, fine fibrous structure. H. = 3-4. G. = 2·53. Lustre pearly. Color gray, often with a greenish tinge. Streak white; subtranslucent to opaque. Fracture splintery to uneven. Feel greasy. Analysis (after the deduction of 28·36 p. c. CaCO₃ mechanically mixed):

SiO ₂	MgO	CaO	Al ₂ O ₃	FeO	MnO	Na ₂ O	H ₂ O
33·99	37·96	5·64	1·33	1·82	0·47	0·98	17·81 = 100.

Formula Mg₂SiO₄ + H₂O. B. B. infusible. Yields water in the closed tube. Decomposed by acids with separation of silica, but does not gelatinize. Occurs intimately mixed with calcite and associated with spodosite, at the Krangrufva in Wermland, Sweden. [Compare villarsite, Min., p. 409.]

MAXITE.—App. II., p. 38; see also *Leadhillite*, App. III., p. 67.

MEERSCHALUMINITE.—App. II., p. 38 (44).

MEIONITE, Min., p. 318; App. II., p. 38.—**Anal.**, by Neminar (Min. Mitth., 1875, 51; 1877, 61), gave: SiO₂ 43·36, Al₂O₃ 32·09, CaO 21·45, MgO 0·31, Na₂O 1·35, K₂O 0·76, H₂O 0·27, Cl 0·14, CO₂ 0·72 = 100·45. See also *Scapolite*, p. 106.

MELACONITÉ, Min., p. 136; App. II., p. 38.—Vesuvius, *Scacchi*, Att. Accad. Napoli, vi., 1873 (Contrib. Min., ii., 12).

Melanophlogite. *A. v. Lasaulx*, J. Min., 1876, 250, 627; 1879, 513.

SULFURICIN, *Guyard*, Bull. Soc. Chim., II., xxii., 61, 1874. *Brezina*, Min. Mitth., 1876, 243.

Occurs in minute cubes, sometimes showing twinning striations. Cleavage cubic, nearly perfect (?) H. = 6·5-7. G. = 2·04. Color light brown or colorless. Lustre vitreous. Transparent. According to Bertrand the apparent cubic crystals are made up of six pyramids having a common vertex and with their bases coinciding with the cubic planes (Bull.

Soc. Min., iii., 160, 1880). Analyses: 1, v. Lasaulx (l. c.); 2, sulfuricin (see below), Guyard (l. c.):

	SiO ₂	SO ₃	H ₂ O	Al ₂ O ₃	Fe ₂ O ₃	SrO	MgO	CaO	
1. <i>Melanophlogite</i> .	86.29	7.2	2.86	0.7		2.8	....	....	= 99.85, Lasaulx.
2. <i>Sulfuricin</i> .	80.38	6.80	6.10	0.43	8.57*	....	0.37	1.25, S 4.10	(= 108).

* Brezina suggests that it probably should be 0.57.

Melanophlogite turns finally black when heated B. B. (hence name from μέλας, *black*, and φλέγεσθαι, *to be burned*). Occurs forming a drusy coating on sulphur, calcite, and celestite, from Girgenti, Sicily.

SULFURICIN, from Greece, is described as a white porous silica, having a sour taste and impregnated with sulphur; the analysis is given above. Melanophlogite does not give an acid reaction. [The possible relation of the two substances mentioned is remarked by Brezina (l. c.). In any case melanophlogite can hardly be regarded as an original mineral, but more probably as an impure form of silica owing its origin to some method of pseudomorphism. v. Lasaulx thinks it cannot be pseudomorphous after fluorite. The observations of Bertrand would not separate it from the so-called *pseudo-isometric* species.]

Melanosiderite. *J. P. Cooke*, Amer. Acad. Sci., x., 451, 1875.

Amorphous; compact. H. = 4.5. G. = 3.391. Lustre vitreous, inclining to resinous. Color black, with a tinge of red. Streak brownish to brick red. Subtranslucent. In the closed tube decrepitates and gives off water. Gelatinizes with hydrochloric acid. B. B. fuses at 4½ to a magnetic mass. Analysis, by W. H. Melville afforded: SiO₂ (3) 7.42, Fe₂O₃ 75.13, Al₂O₃ 4.34, H₂O (at 100°) 6.17, H₂O (above 100°) 7.68 = 100.74. Cooke writes the formula [Fe₂]₁₁SiO₁₁.6H₂O, which requires: Fe₂O₃ 79.21, SiO₂ 7.42, H₂O 13.37 = 100. If the silica is an impurity the composition is exactly that of limonite, as the author remarks; this seems more probable than that it is a true silicate. Locality, Mineral Hill, Delaware Co., Penn. Named from μέλας and σίδηρος, in allusion to the black color.

Genth (Second Rep. Min. Pennsylvania, p. 216, 1876), suggests that melanosiderite is only a variety of an iron hydrate, probably a limonite; Cooke, however, regards it as a basic silicate on the ground of its vitreous lustre, fusibility, definite composition, and the fact that it gelatinizes with acids.

Melanotekite. *G. Lindström*, Öfv. Ak. Förh. Stockh., xxxv., 6, p. 53, 1880.

Massive. Cleavage in two directions, in one of these most distinct. H. = 6.5. G. = 5.73. Lustre metallic to resinous. Color black to blackish gray. Streak greenish gray. Opaque to translucent under the microscope. Dichroic, bottle green and red brown. Analyses: 1, after deducting 2.56 p. c. impurities; 2, after deducting 3.30 p. c.:

	SiO ₂	Fe ₂ O ₃	PbO	CaO	FeO	MnO	CaO	MgO	K ₂ O	Na ₂ O	
1.	17.32	23.18	55.26	0.20	0.75	0.69	0.02	0.59	0.24	0.54	BaO 0.11 (?) Cl 0.14, P ₂ O ₅ 0.07, ign. 0.93 = 100.04.
2.	17.22	22.81	58.42	....	....	0.57	....	0.33	0.18	0.33.	

The atomic ratio for R: [R₂]: Si = 2: 1: 2, and the empirical formula is Pb₂[Fe₂]Si₂O₆. B. B. fuses with intumescence to a black bead; with soda on charcoal gives a globule of lead and a lead coating. With borax reacts for iron, but on strong heating in R. F. becomes on cooling black and opaque (reduced lead), with salt of phosphorus gives a skeleton of silica. Decomposed by nitric acid.

Occurs with native lead, intimately mixed with magnetite and yellow garnet at Långban in Wernmland, Sweden. This locality has furnished two other lead silicates, hyalotekite and ganomalite (q. v.). Named in allusion to the related hyalotekite, from μέλας, *black*, and τήκειν, *to melt*. Lindström calls attention to the fact that of the two possible formulas for kentrolite proposed by Damour and vom Rath (see p. 65), the second corresponds exactly to the above composition of melanotekite, viz.: Pb₂[Mn₂]Si₂O₆, which establishes an interesting relation between the two minerals.

Melanothallite. *A. Scacchi*, copper chloride from the eruption of Vesuvius in 1870. Att. Accad. Napoli. (Bull. Soc. Min., i., 138).

MELANTERITE, Min., p. 646.—Cryst., and anal., Idria, v. *Zepharovich*, Ber. Ak. Wien, lxxix., 183, 1879.

A variety of melanterite containing a little manganese is called LUCKITE by *Carnot* (Bull. Soc. Min., ii., 168, 1879). In irregular striated prisms. Colorless or slightly bluish. Analysis: SO_3 26.3, FeO 21.7, MnO 1.9, MgO 0.2, CaO 0.5, H_2O [42.2], insol. 7.2 = 100. For this the formula is calculated $(\text{Fe}, \text{Mn})\text{SO}_4 + 7\text{aq}$, with $\text{Fe} : \text{Mn} = 11 : 1$. From the silver mine "Lucky Boy," south of Salt Lake, near Butterfield Cañon, Utah.

MELINOPHANE (MELIPHANITE), Min., p. 263; App. II., p. 38.—In tetragonal crystals with I and 1 ; c (vert.) = 0.6584, $1 \wedge 1$ (terminal) = $122^\circ 23'$, Brevig, *Bertrand*, C. R., lxxxiii., 711, 1876.

The composition is discussed by *Rammelsberg* (ZS. G. Ges., xxviii., 61, 1876), who makes the formula $7\text{R}_3\text{Si}_2\text{O}_7 + 6\text{NaF}$, with $\text{R} = \text{Be} : \text{Ca} = 1 : 1$, and $\text{Na} : \text{K} = 9 : 1$; this requires: SiO_2 42.95, BeO 13.60, CaO 30.07, Na_2O 8.56, K_2O 1.44, F 5.83 = 102.45. It is undoubtedly distinct from leucophanite (q. v.).

MELLITE, Min., p. 750.—Artificially produced, *Friedel* and *Balsohn*, Bull. Soc. Min., iv., 26, 1881.

MENACCANITE, Min., p. 143, App. II., p. 38.—Cryst., tetartohedral, v. *Kokscharof*, Min. Russl., vi., 350, 1874. Binnenthal, tetartohedral, *Bücking*, Z. Kryst., i., 576, 1877; ii., 416, 1878. *Sadebeck*, Pogg. Ann., clvi., 557, 1875; J. Min., 1878, 287. *Groth*, Min.-Samml. Strassburg, p. 76, 1878.

Comp. discussed, *Friedel* and *Guérin*, Ann. Ch. Phys., V., viii., 28, 1876.

From diamond fields, So. Africa, anal. containing 12 p. c. MgO (compare anal. 24, Min., p. 144), *Cohen*, J. Min., 1877, 695. Egersund, Norway, *Tamm*, Geol. För. Förh., ii., 46, 1874.

A partially altered variety of menaccanite has been called HYDROILMENTITE by *C. W. Blomstrand* (Minneskrift Fys. Sällsk., Lund, 1878, p. 4). It forms thin (1-6 mm.) curved plates with tolerably distinct rhombohedral cleavage ($R \wedge R = 86^\circ - 87^\circ$), and basal less so. $G. = 4.063-4.136$. Color iron black. Streak dark gray. Lustre metallic. Not magnetic. Analyses:

	TiO_2	SiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	H_2O
1. $\left(\frac{2}{3}\right)$	60.80*	undet.	18.83†	15.75†	3.28	0.42	...	1.75.
2. $\left(\frac{3}{3}\right)$	54.23	1.40	14.99	21.91	6.34	0.45	0.19	1.33 = 100.84.

* With SiO_2 ?

† The correctness of this separation is questioned.

The mineral decomposes readily, and finally becomes coated with a yellowish white crust consisting essentially of TiO_2 . Probably altered from normal menaccanite by the assumption of water. From Småland, Sweden.

MENDOZITE, Min., p. 653.—Anal. Punta de Belen, Argentine Repub. (*Schickendantz*), *Brackebusch*, Min. Argentin., 75, 1879.

MENEGHINITE, Min., p. 105; App. II., p. 38.—Anal. (by *Martini* and *Funaro*), Bottino, Italy, *D'Achiardi*, Att. Soc. Tosc., ii., 116, 1876.

Meróxene.—See *Mica Group*, p. 77.

MESOLITE, Min., p. 430; App. II., p. 38.—*Lüdecke* (J. Min., 1881, ii., 1), makes the crystals from Iceland monoclinic. An analysis by *Schmid* (Pogg. Ann., cxlii., 118), gave: SiO_2 46.58, Al_2O_3 27.57, CaO 9.11, MgO 0.08, Na_2O 3.64, H_2O 12.94, which corresponds very closely to the formula accepted by *Rammelsberg*, $\left\{ \text{Na}_2\text{Al}_2\text{Si}_3\text{O}_{10} + 2\text{aq.} \right\}$ *Lüdecke* also refers here the monoclinic mesolite of *Credner* from the Pflasterkaute, which gave him: SiO_2 43.83, Al_2O_3 29.04, CaO 7.84, Na_2O 7.80, H_2O 11.75. See also *Scolecite*, p. 107.

METACINNABARITE, App. I., p. 10.—See *Onofrite*, p. 86.

METAXOITE (Chonierite) Min., p. 494.—*Wiik* (J. Min., 1876, 204, *Kennigott*, ib., p. 517).

MEYMACITE.—App. II., p. 38.

MIARGYRITE, Min., p. 88.—*Cryst.*, Bräunsdorf, *Weisbach*, Z. Kryst., ii., 55, 1877; *Groth*, Min.-Samml. Strassburg, p. 59, 1878.

Analyses by L. Sipőcz (Min. Mitth., 1877, 213), 1, miargyrite from Felsöbanya; 2, kennigottite from Felsöbanya; 3, by Jenkins (J. Min., 1880, ii., 109), hypargyrite from Andreasberg.

		S	Sb	Ag	Pb	Cu	Fe	
1.	G. = 5.298 (½)	21.80	40.68	32.77	4.01	0.51	0.19	= 99.96.
2.	Kennigottite, G. = 5.337	20.66	39.46	35.28	1.76	0.50	0.25	= 97.91.
3.	Hypargyrite, (½)	21.35	41.07	37.40	....	....	....	As 0.79 = 100.61.

These correspond to the accepted formula $AgSbS_2 = Ag_2S, Sb_2S_3$, and prove that kennigottite and hypargyrite are, as supposed, identical with miargyrite, the former containing a little lead. *Weisbach* had previously shown that hypargyrite agreed in form and physical characters with miargyrite (Z. Kryst., ii., 63, 1877). An analysis by *Andreasch* of miargyrite from Prizbram gave S 21.68, Sb 41.15, Ag 36.71, Fe tr. = 99.54, both lead and copper being absent (Min. Petr. Mitth., iv., 185, 1881).

See also *Alaskaité*, p. 3.

MICA GROUP, Min., p. 301, et seq.; App. II., p. 39.—The optical investigations of *Tschermak* (Ber. Ak. Wien, lxxvi., 97, 1877; or Z. Kryst., ii., 14), have shown that all the micas are to be referred to the *monoclinic system*, the axis of elasticity being inclined a few degrees to the normal to the plane of cleavage. The exhaustive morphological study of *von Kokscharof* (Mem. Acad. St. Pet., VII., xxiv.; see also Min. Russl., vii., 167, 177, 222, 225; viii., 1) finally led him to a conclusion not at variance with this, although he shows that the angles alone do not require the assumption of any obliquity. The results of *Bauer* (Ber. Ak. Berlin, 1877, 684; or Min. Petr. Mitth., i., 14, 1878) confirm those of *Tschermak*; he has also determined the indices of refraction of muscovite, by a method based upon relations (established by *Neumann*) between the optical axes of elasticity and the distances, measured in the axial plane, between the dark rings of the interference figures.

Measurements of elasticity, *Coromilas*, Inaug. Diss. Tübingen, 1877 (Z. Kryst., i., 411). On the figures produced by etching, *Baumhauer*, Z. Kryst., iii., 113, 1878. *Wiik*, Öfv. Finsk. Vet. Soc., xxii., 1880.

Association of muscovite and biotite (meroxene) in parallel position, from Middletown, Conn., *Hawes* (anal. of the biotite ½: SiO₂ 35.61, Al₂O₃ 20.03, Fe₂O₃ 0.13, FeO 21.85, MnO 1.19, MgO 5.23, K₂O 9.69, Na₂O 0.52, Li₂O 0.93, TiO₂ 1.46, F 0.76, Cl tr., H₂O 1.87 = 99.27, cf. haughtonite below), Am. J. Sc., III., xi., 431, 1876; v. *Lasaulx*, J. Min., 1878, 630.

Tschermak (l. c. and Ber. Ak. Wien, lxxviii., 5, 1878, or Z. Kryst., iii., 122) divides the species of the mica group as follows:

	I.	II.
<i>Biotites</i> :	Anomite;	Meroxene, Lepidomelane.
<i>Phlogopites</i> :		Phlogopite, Zinnwaldite.
<i>Muscovites</i> :	} Lepidolite. Muscovite. Paragonite.	
<i>Margarites</i> :		Margarite.

In the first group (i) are included all the micas in which the optic-axial plane is perpendicular to the plane of symmetry; the second group (ii) includes those in which it is parallel to the plane of symmetry. For the crystallographic relations of the different species reference must be made to the original paper. The chemical relations reached by *Tschermak* are based for the most part on a series of new analyses, very carefully made, to avoid errors fallen into by earlier analysts; these are quoted beyond.

Tschermak, on optical grounds (see above), divides biotite into ANOMITE (from *ἀνομός*, contrary to law) and MEROXENE (*Breithaupt's* name for the Vesuvian biotite, see Min., p. 307). *Anomite* is represented by the mica occurring with diopside in granular calcite, at

Lake Baikal, and that from Greenwood Furnace, N. Y. Its composition, according to Tschermak's view, is expressed by isomorphous mixtures of $H_2K_4Al_6Si_6O_{24}$ (see muscovite, below), and $Mg_{12}Si_6O_{12}$ (a hypothetical polymere of chrysolite), in the relation of 1 : 1, or 2 : 1, or intermediate ratios. *Meroxene* is represented by the Vesuvian magnesian mica; composition $H_2K_2Al_6Si_6O_{24}$, and $Mg_{12}Si_6O_{12}$, in the ratio of 1 : 1, of 2 : 1, or intermediate ratios. *Lepidomelane* has the composition $H_4K_2Al_6Si_6O_{24}$, and $Mg_{12}Si_6O_{12}$, with, however, varying amounts of the iron compound $H_4K_2Fe_2Si_6O_{24}$. [In this group would belong the haughtonite of Heddle, and siderophyllite of Lewis (see below), varieties characterized by the replacement to large extent, of Mg by Fe.]

Phlogopite has the composition : $K_6Al_6Si_6O_{24}$, $H_6Si_6O_{24}$, and $Mg_{12}Si_6O_{24}$, often in the relation 3 : 1 : 4; generally also with $F_2Si_6O_8$ in the place of the second compound. *Zinnwaldite* has the composition : $K_6Al_6Si_6O_{24}$ (or $Li_6Al_6Si_6O_{24}$), $Fe_{12}Si_6O_{24}$, and $F_2O.Si_6O_8$ (or the corresponding hydrogen compound), in the relation of 10 : 2 : 3.

The corresponding muscovites include lepidolite, muscovite, and paragonite. *Lepidolite* has the composition : $3K_6Al_6Si_6O_{24} + Si_6O_8.F_2O$, with the first replaced one-half or more by the corresponding lithium compound, and the second by the corresponding hydrogen compound (see also Min. Petr. Mitth., ii., 94, 1879). *Muscovite* (including margarodite) : $K_6Al_6Si_6O_{24}$, with the potassium compound replaced in part by the corresponding hydrogen compound, $H_6Al_6Si_6O_{24}$; the commonest formula is $H_4K_2Al_6Si_6O_{24}$. In certain muscovites, for which the name PHENIGITE is proposed, the composition is explained as a combination of $H_4K_2Al_6Si_6O_{24}$, and $H_6Si_6O_{24}$, in the ratio of 3 : 1; these varieties approach to lepidolite. *Paragonite* (incl. cossaitite), composition : $H_4Na_2Al_6Si_6O_{24}$.

Margarite, composition : $H_4Ca_2Al_6Si_6O_{24}$; related to the clintonite group, see p. 28.

[For the many important details of the crystallographic relations, and, too, the discussion upon which the above conclusions as to the composition are based, reference must be made to the original articles.]

Analyses employed in the above discussion : 1, by John, Lake Baikal; 2, by P. v. Hamm, Greenwood Furnace, G. = 2·846; 3, by A. Zellner, Tschebarkul, Siberia, G. = 3·004; 4, by J. Rumpf, Morawitz; 5, by Berwerth, Vesuvius, G. = 2·86; 6, E. Ludwig, with pargasite in granular limestone, G. = 2·867; 7, by E. Neminar, Penneville, G. = 2·779; 8, by A. Poppovits, Ratnapura, Ceylon, G. = 2·742; 9, by Berwerth, Edwards, N. Y.; 10, by Berwerth, Zinnwald; 11, by Berwerth, Paris, Me., G. = 2·855; 12, by Berwerth, Rozena, G. = 2·839; 13, by S. Blan, Bengal, G. = 2·831; 14, by L. Sipőcz, East Indies, G. = 2·830; 15, by L. Sipőcz, Rothenkopf in the Zillerthal, G. = 2·302; 16, by Löbisch, Soboth in Steiermark.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	K ₂ O	Na ₂ O	Li ₂ O	H ₂ O	F
1. <i>Anomite</i> ,	40 00	17 28	0 72	4 88	....	23 91	....	8 57	1 47	....	1 37	1 57 = 99 77.
2. "	40 81	16 47	2 16	5 92	....	21 08	....	9 01	1 55	....	2 19	tr. = 99 19.
3. <i>Meroxene</i> ,	38 49	14 43	5 54	14 75	tr.	16 34	....	8 12	0 53	....	0 89	tr. = 99 00.
4. "	40 16	15 79	2 53	4 12	tr.	26 15	tr.	7 64	0 37	....	3 58	.... = 100 34.
5. "	39 30	16 95	0 48	7 86	0 59	21 89	0 82	7 79	0 49	....	4 02	0 89 = 101 08.
6. <i>Phlogopite</i> ,	43 43	13 76	0 16	1 35	....	27 20	....	8 06	1 30	....	0 92	4 21 = 100 89.
7. "	44 29	12 12	1 40	1 44	....	27 86	....	7 06	2 16	....	2 09	1 94 = 100 36.
8. "	42 26	15 64	0 23	1 52	....	27 23	....	8 68	....	....	2 91	2 19 = 100 66.
9. "	40 64	14 11	2 28	0 69	....	27 97	2 54 BaO	8 16	1 16	....	3 21	0 82 = 101 55.
10. <i>Zinnwaldite</i> ,	45 87	22 50	0 66	11 61	1 75	....	....	10 46	0 42	3 28	0 91	7 94, P ₂ O ₅ 0 08 = 105 48.
11. <i>Lepidolite</i> ,	50 39	28 19	....	....	....	....	....	12 34	....	5 08	2 36	5 15 = 103 51.
12. "	50 98	27 80	....	0 05	....	....	....	10 78	....	5 88	0 96	7 88, P ₂ O ₅ 0 05 = 104 38.
13. <i>Muscovite</i> ,	45 57	36 72	0 95	1 28	....	0 38	0 21	8 81	0 62	0 19	5 05	0 15 = 99 93.
14. "	45 71	36 57	1 19	1 07	....	0 71	0 46	9 22	0 79	....	4 83	0 12 = 100 67.
15. <i>Phenigite</i> ,	45 87	3 86	5 70	1 69	....	1 56	0 28	9 07	0 54	....	4 60	.... = 100 12.
16. "	48 76	29 91	4 24	0 41	....	2 63	0 33	6 83	2 31	....	4 60	.... = 100 02.

Rammelsberg has also published (Wied. Ann., ix., 113, 302, 1880; also vii., 136, 1879) a recent investigation of the chemical composition of the species of the mica group, including a considerable number of new analyses. He concludes that the micas are in part unisilicates, in part compounds of unisilicates and bisilicates; he also assumes the isomorphism

between these, as well as between similar silicates of metals of the $\overset{I}{R}$, $\overset{II}{R}$, $[\overset{III}{R}]$ series respectively. He adopts a chemical classification, as follows :

1. ALKALI micas : A. *Sodium* mica (paragonite) formula $R_2[Al_2]Si_2O_8$ (unisilicate). B. *Potassium* mica (muscovite), including (1) unisilicates, $R_2[Al_2]Si_2O_8$, with sometimes (Mg, Fe) SiO_4 ; (2) compounds of unisilicates and bisilicates in the ratio of 1 : 3, thus $R_1R[Al_2]Si_1O_{16}$, Si_1O_{16} (anal. 1, 2, 3), or in the ratio of 1 : 1, thus : $\overset{I}{R}_2Si_2O_8 = \overset{I}{R}_2SiO_8 + \overset{I}{R}_4SiO_8$, or more

specially in part, $R_1R_2[R_2]_2Si_{18}O_{65}$. C. *Lithium mica* (lepidolite, anal. 4, 5, 6a, 6b): compounds of unisilicates and bisilicates in the ratio of 1:3, thus: $R_{10}Si_3O_{13} = 3R_2SiO_3 + R_4SiO_4$; or more specially $R_{10}[R_2]_5Si_3O_{62}$ (Rozena and Paris), and $R_{14}[R_2]_7Si_2O_{65}$ (Juschakowa).

2. The **MAGNESIUM mica** (biotite pt., anal. 7, 8, 9) is a compound of bisilicates and unisilicates in the ratio of 1:3, thus: $R_{14}R_{26}[R_2]_7Si_{26}O_{135}$.

3. The **IRON-MAGNESIUM mica** (biotite pt.) and **IRON mica** (lepidomelane), includes five series, having the following formulas: (1) $R_2R_4[R_2]Si_3O_{16} = R_4SiO_4 + 4R_2SiO_4 + [R_2]_2Si_3O_{12}$ (anal. 10, 11). (2) $R_4R_8[R_2]Si_2O_{28} = R_4SiO_4 + 3R_2SiO_4 + [R_2]_2Si_3O_{12}$ (anal. 12, 13, 14, 15). (3) $R_2R_2[R_2]Si_2O_{22} = R_4SiO_4 + 2R_2SiO_4 + [R_2]_2Si_3O_{12}$ (anal. 16, 17). (4) $R_2R_3[R_2]Si_2O_{20} = R_4SiO_4 + 3R_2SiO_4 + 2[R_2]_2Si_3O_{12}$ (anal. 18, 19). (5) $R_6R_5[R_2]_4Si_3O_{26} = 3R_4SiO_4 + 2R_2SiO_4 + 4[R_2]_2Si_3O_{12}$. To this group are appended several which do not admit of being classified.

4. The **LITHIUM-IRON mica** of Zinnwald (zinnwaldite, anal. 20) is regarded as a compound of bisilicate and unisilicate in the ratio of 2:1, thus: $R_2Si_3O_{10} = 2R_2SiO_3 + R_4SiO_4$; more specially $R_{10}R_4[R_2]_5Si_{18}O_{66}$, or $R_{12}R_4[R_2]_6Si_{21}O_{76}$, according to the ratio of the different elements.

5. The **BARIUM mica** (cellacherite, anal. 21) is a unisilicate, with the special formula: $R_8R_2[R_2]_4Si_3O_{26} = 2R_2SiO_4 + R_2SiO_4 + 2[R_2]_2Si_3O_{12}$.

Analyses by Rammelsberg (see also Ber. Ak. Berlin, 1878, 616; 1879, 248, 833; ZS. G. Ges., xxxi., 676, 1879):

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	Mn ₂ O ₃	FeO	MnO	MgO	K ₂ O	Na ₂ O	Li ₂ O	H ₂ O*	F
1. So. Royalston, Mass.	45.97	30.40	5.11	....	1.05	....	2.03	9.92	0.59	....	4.50	0.74 = 100.31.
2. Ytterby	45.21	33.40	2.78	....	2.00	....	1.53	10.71	0.42	....	4.28	0.94 = 101.32.
3. Broddbo	47.13	30.60	4.81	....	0.61	....	1.30	10.26	0.74	....	4.78	0.64 = 100.87.
4. Rozena	51.32	26.00	....	1.30†	....	....	9.98	0.96	3.87	0.57	7.18	= 101.18.
5. Paris	52.61	28.43‡	....	....	....	....	10.89	0.79	4.09	0.22	5.19	= 102.22.
6a. Juschakowa (‡)	50.26	21.47	....	5.36†	....	....	11.08	0.54	4.88	0.66	8.71, Cl 1.16	= 104.12.
6b. "	50.06	22.20	....	5.38	....	....	11.39	0.32	5.65	....	8.58	= 104.48.
7. Rossie, N. Y.	43.17	13.43	....	....	1.51	....	27.47	8.73	0.92	....	0.40	5.11 = 101.04.
8. Gouverneur, N. Y.	43.00	13.27	1.71	....	....	27.70	10.32	0.30	....	0.28	5.67	= 102.35.
9. Pargas	52.55	12.74	1.31	....	0.49	....	27.62	8.92	1.18	....	1.50	4.59 = 100.90.
10. Monzoni	41.70	16.86	2.23	....	1.88	0.86	24.70	8.93	0.28	....	1.14	0.53 = 99.11.
11. Arendal	38.89	14.53	4.58	....	7.85	1.06	20.28	10.08	0.40	....	0.94	1.49 = 100.10.
12. Miask	32.49	12.34	6.56	....	23.60	1.53	5.29	9.59	0.88	....	3.73	1.61, TiO ₂ 4.03 = 101.65.
13. Fillipstad	38.20	15.45	8.03	....	8.69	0.90	18.08§	9.17	0.18	....	2.94	1.15 = 103.39.
14. Sterzing	39.82	15.25	2.62	....	4.62	1.11	21.41||	8.33	0.66	....	1.87	tr. = 99.69.
15. Persberg	37.77	15.96	6.63	....	14.43	....	12.26	8.23	0.27	....	2.67	0.44, TiO ₂ 2.12 = 100.78.
16. Hiterö	39.01	15.44	9.37	....	13.67	....	11.30	8.62	0.14	....	2.05	1.29 = 101.39.
17. Renchthal	37.79	18.79	6.48	....	15.28	....	9.72	8.93	1.92	....	2.33	tr. = 101.12.
18. Brevig	32.97	11.88	16.48	....	20.72	3.64	1.08	8.03	0.30	....	3.35	1.29, TiO ₂ 2.42 = 102.16.
19. St. Dennis	37.93	24.89	7.85	....	14.87	....	0.28	8.64	0.40	....	1.54	4.23 = 100.63.
20. Zinnwald	46.44	21.84	1.27	....	10.19	1.57	0.18	10.58	0.54	3.36	1.04	7.62 = 104.63.
21. Sterzig	42.90	32.40	tr.	....	2.40	....	3.10	7.47	1.73	....	3.02, BaO 5.82, CaO 0.80 = 99.64.	

* Hygroscopic water here included: in anal. (1) 0.50; in (2) 0.33; in (3) 0.76; in (9) 0.32; in (12) 1.31; in (14) 0.18; in (16) 0.12. † With MgO included. ‡ With tr. Mn₂O₃ included. § With 1.5 CaO included. || With 1.41 BaO included.

HAUGHTONITE of *Heddle* (Min. Mag., iii., 72, 1879) is a variety of biotite, in which the magnesium is largely replaced by iron. G. = 2.96-3.13. Fuses with difficulty to a black magnetic globule. Color dark brown to jet black. Small axial angle. Occurs mostly in granitic and gneissoid rocks, also in diorite, at various Scottish localities, as below. Analyses by Heddle: 1, from hornblendic gneiss of Roneval; 2, from the hill of Capval; 3, Nishibost; 4, from the shore of Loch-na-Muilne; 5, Fionaven in Sutherland; 6, Ben Stack; 7, Rispond; 8, Clach-an-Eoin; 9, Kinnaird's Head, Aberdeenshire; 10, Cove near Aberdeen; 11, Lairg, in Sutherland; 12, Portsoy in Banffshire.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	CaO	MgO	Na ₂ O	K ₂ O	H ₂ O
1. G. 3.03	37.16	15.00	7.69	17.35	1.04	1.20	8.88	1.60	8.18	2.12 = 100.17.
2. G. 3.07	36.81	15.22	7.61	17.35	0.96	1.54	8.78	1.34	8.31	2.47 = 100.40.
3. G. 3.05	35.15	16.70	5.96	19.06	1.02	0.82	7.46	1.26	9.24	3.13 = 99.81.
4.	36.46	17.25	4.18	15.33	0.54	0.69	12.23	0.66	9.20	3.39 = 99.92.
5. G. 3.03	36.75	7.86	2.78	15.18	0.42	0.93	11.17	1.25	9.44	4.23 = 99.99.
6. G. 3.05	25.69	20.09	2.23	14.01	1.00	1.89	14.77	0.53	7.38	2.47 = 100.86.
7. G. 2.99	36.54	22.28	2.43	16.01	0.78	1.25	10.00	0.79	8.26	1.51 = 99.86.
8. G. 2.96	35.85	21.54	4.48	18.31	0.31	1.25	8.08	0.79	7.76	1.96 = 100.33.
9. G. 3.13	35.67	17.05	7.19	18.06	2.00	1.40	1.50	3.81	9.27	3.20 = 100.05.
10.	35.47	18.90	4.61	19.19	0.64	0.90	7.01	0.24	8.19	4.97 = 100.02.
11.	35.56	16.69	1.88	18.04	0.69	2.72	8.47	0.11	9.90	5.71 = 99.77.
12. G. 3.07	34.08	17.34	3.61	18.70	0.38	3.23	10.54	1.19	6.78	4.05 = 99.90.

Other analyses by Heddle are given in *Min. Mag.*, iv., 221 et seq., 1881; and the same variety has been repeatedly analyzed previously (see above).

A mica closely related to the above (a biotite containing only Fe) has been called *SIDERO-PHYLLITE* by *H. C. Lewis* (*Proc. Ac. Nat. Sc. Philad.*, 1880, 254). $H. = 3.2$. $G. = 3.1$. Color black; by transmitted light chrome green. Brittle. Axial angle about 10° . An analysis gave ($\frac{3}{8}$): SiO_2 36.68, Al_2O_3 20.41, Fe_2O_3 1.55, FeO 25.50, MnO 2.10, MgO 1.14, CaO 0.81, Na_2O 1.09, Li_2O 0.37, K_2O 9.20, H_2O 1.01 = 99.86. This corresponds to $R_3[R_2]Si_2O_{12}$. Fuses with intumescence at 2.5 to a black glass. Soluble in HCl and H_2SO_4 with separation of silica. From near Pike's Peak, Colorado.

EUCHLORITE of *C. U. Shepard* is shown by *Pisani* (*C. R.*, lxxxiii., 167, 1876) to be ordinary biotite. From Chester, Mass. $H. = 2.5$. $G. = 2.84$. Color dark green. Lustre on the cleavage face pearly. Axis negative. B. B. fusible with difficulty to a black enamel. Slowly soluble in concentrated HCl . An analysis gave *Pisani*: SiO_2 39.55, Al_2O_3 15.95, Fe_2O_3 7.80, MgO 22.25, K_2O , Na_2O 10.35, ign. $4.10 = 100$.

MICARELL. *Wichmann* (*ZS. G. Ges.*, xxvi., 701, 1874) uses this name (of *Freiesleben*) to designate the original mineral from which the so-called pinite from Stolpen, near Neustadt, has been derived. It is regarded as certain that it is not iolite nor tourmaline, but its true nature is doubtful.

Microcline. *Des Cloizeaux* (*Ann. Ch. Phys.*, V., ix., 433, 1876) uses *Breithaupt's* name (see *Min.*, p. 355) to designate a new feldspar species established by him: a triclinic potash feldspar.

Triclinic and near orthoclase in form, and in habit, twinning, etc., but $O \wedge i-\gamma = 90^\circ 16'$. Extinction direction makes an angle of 15° to 16° (orthoclase = 0°), with the edge $O / i-\gamma$. Polysynthetic twinning, giving rise to striations on O , sometimes observed. A basal section shows in polarized light a characteristic grating-like structure, due to the regular intergrowth of twin lamellæ; in these, orthoclase is often enclosed; irregular lines and bands of albite also often observed.

Composition $K_2[Al_2]Si_2O_{10}$, or that of orthoclase; an analysis of pure white microcline from Magnet Cove, Arkansas, gave *Pisani*: SiO_2 64.30, Al_2O_3 19.70, Fe_2O_3 0.74, K_2O 15.60, Na_2O 0.48, ign. $0.35 = 101.17$. $G. = 2.54$.

A large part of the potash feldspar, previously called orthoclase, is in fact microcline. Here belong the *chesterlite* from Chester, Penn., the beautiful amazonstone of Pike's Peak, Colorado (the color due to an organic salt of iron, according to *König*, *Proc. Ac. Nat. Sc. Philad.*, 1876, 156), as also that of other localities; also feldspar from Mineral Hill, Penn., *Leverett* (not *Everett*), Mass., and many foreign localities. It is obtained in large quantities at Branchville, Conn., some single cleavage surfaces having a length of 10 feet; also observed at the same locality pseudomorph after *spodumene*. The perthite of Canada is in part microcline (*J. Min.*, 1879, 389).

MICROLITE, *Min.*, p. 513; *App. II.*, p. 39.—Described by *Nordenskiöld* (*Geol. Förf. Förh.*, iii., 282, 1877). In small brilliant isometric octahedrons with dodecahedral planes. Color light grayish yellow to blackish brown. Translucent to semi-translucent. $H. = 5.5-6$. $G. = 5.25$. An approximate analysis gave: Ta_2O_5 , Cb_2O_6 77.3, SnO_2 0.8, CaO 11.7, MnO (FeO tr.) 7.7, MgO 1.8 = 99.3. Formula $(Ca, Mn, Mg)_2Ta_2O_7$, which requires: Ta_2O_5 78.82, MnO 7.69, CaO 11.69, MgO 1.80 = 100. B. B. infusible. Occurs with red and green tourmaline, petalite, *spodumene*, etc., in pegmatite, at Utö, Sweden.

Occurs at Branchville, Conn., *Brush* and *Dana*, *Am. J. Sc.*, III., xvi., 34, 1878.

Described by *F. P. Dunnington* (*Am. Chem. Journ.*, iii., 130, 1881) as occurring at the mica mines in Amelia Co., Virginia. In single crystals from $\frac{1}{16}$ in. to $\frac{3}{8}$ in., with O , i , and β -3; also in large (up to 4 lbs.) imperfect crystals. $H. = 6$. $G. = 5.656$. Lustre glistening resinous. Color wax yellow to brown. Streak pale ochreous yellow. Subtranslucent. Fracture conchoidal. Brittle. An analysis gave: Ta_2O_5 68.43, Cb_2O_6 7.74, WO_3 0.30, SnO_2 1.95, CaO 11.80, MgO 1.01, BeO 0.34, U_2O_3 1.59, Y_2O_3 0.23, Ca_2O_3 (Di_2O_3) 0.17, Al_2O_3 0.13, Fe_2O_3 0.29, Na_2O 2.83, K_2O 0.29, F 2.85, H_2O 1.17 = 100.25, deduct O replaced by F 1.20 = 99.05. The probable formula deduced is $3(Ca_2Ta_2O_7) + CbOF_6$. In the closed tube decrepitates and gives off water. B. B. infusible, glows momentarily, colors the flame reddish yellow, and on cooling is dull pale yellow. Not attacked by strong HCl , slowly decomposed by H_2SO_4 and by fusion with caustic potash; readily decomposed by fusion with acid potassium sulphate. Associated with the true microlite is monazite in large masses (up to 8 lbs.). It was at first called altered microlite (priv. contrib., *W. M. Fontaine*).

A mineral related to microlite, from Haddam, Conn., is called HADDAMITE by *C. U. Shepard* (Am. J. Sc., II., 1., 93, 1870; Min. Contr., 1877). What its true character is, if it be a distinct species, has not been determined.

MICROLITES.—App. II., p. 39.

MICROSOMMITE, App. II., p. 39.—Analyses 1, 2 by *Scacchi* (Rend. Accad. Sc. Napoli, April, 1876); 3, 4 by *Rauff* (Z. Kryst., ii., 468, 1878). 1, large crystals, Monte Somma, 2, microscopic crystals from bombs thrown out in April, 1872; 3, 4, crystals from Mt. Somma; 3, colorless; 4, yellow.

	SiO ₂	Al ₂ O ₃	CaO	Na ₂ O	K ₂ O	Cl	SO ₂	CO ₂	
1. (2)	32.21	29.22	12.60	10.14	6.79	6.71	4.43	....	= 102.15, deduct O replaced by Cl 1.51 = 100.59.
2. (3)	31.42	30.34	10.93	9.37	7.90	7.82	5.26	....	= 103.04, deduct O 1.76 = 101.28.
3. (3)	32.21	28.37	10.59	11.30	7.14	7.09	3.86	1.55	S tr. = 102.11, deduct O 1.60 = 100.51.
4.	32.23	28.98*	10.36	11.01	7.11	6.25	4.11	1.26	S tr. = 102.01, deduct O 1.56 = 100.45.

* (Fe₂O₃ tr.)

The crystals examined by *Rauff* were large as compared with the original mineral. *Scacchi* describes prismatic crystals with I , i -2, i -3, 1, O ; c (vert.) = 0.41834; $1 \wedge 1$ (adj) = 124° 53', $1 \wedge I$ = 115° 47'; the form corresponds very closely to that of nephelite (c (vert.) = .8390 = $2c$ (vert.) microsommite, Min., p. 327). Cleavage I perfect, O less distinct (as in nephelite). H = 6. G = 2.444 (*Rauff*), 2.42-2.53 (*Scacchi*). Lustre I brilliant silky. The formula calculated by *Rauff* is 2 [(CaSO₄) + 3CaAl₂Si₂O₈] + [4NaCl + 3Na₂Al₂Si₂O₈] + [4NaCl + 3K₂Al₂Si₂O₈], he also makes the rather improbable assumption that a portion of the Si is replaced by C (Si : C = 20 : 1), the formula then requires: SiO₂ 32.68, CO₂ 1.20, Al₂O₃ 29.33, CaO 10.67, Na₂O 10.34, K₂O 6.72, SO₂ 3.81, Cl 6.77 = 101.52, deduct O 1.52 = 100. *Rauff* also shows that the mineral from Mt. Somma called *davyne* is in part an altered microsommite. See also *Cancrinite*, p. 20.

Microschörlite, Microvermiculite.—See *Kaolinite*, p. 65.

MILARITE, App. I., p. 10; II., p. 39.—Crystals shown by *Des Cloizeaux* (J. Min., 1878, 42, 370), and also by *Tschermak* (Min. Mitth., 1877, 350), and *Bertrand* (Bull. Soc. Min., iv., 10, 1881), to be orthorhombic, the pseudo-hexagonal form being due to twinning similar to that of aragonite, witherite, etc. An analysis by *Ludwig* (Min. Mitth., 1877, 349), gave:

	SiO ₂	Al ₂ O ₃	CaO	MgO	K ₂ O	Na ₂ O	H ₂ O
(2)	71.81	10.67	11.65	tr.	4.86	tr.	1.36 = 100.35.

The formula given by *Ludwig* is HKCa₂Al₂Si₂O₃₀, which requires: SiO₂ 72.66, Al₂O₃ 10.39, CaO 11.30, K₂O 4.74, H₂O 0.91 = 100.

Kuschel (J. Min., 1877, 926), repeats the statement of *Frenzel* (J. Min., 1873, 797; App. II., p. 39), that the mineral is found in Val Giuf, not Val Milar, and adds that it ought on this account to be called *giufite*.

MILLERITE, Min., p. 56; App. II., p. 40.—Found at Micheroux, Belgium, *Firket*, Bull. Soc. Geol. Belg., v., 120, 1878; vi., 152, 1879.

MIMETITE.—Min., p. 537; App. II., p. 40.—Etching experiments by *Baumhauer* show mimetite to be pyramidal-hemihedral like apatite (J. Min., 1876, 411).

Bertrand (Bull. Soc. Min., iv., 36, 1881), has made the interesting observation that crystals of pure lead arsenate are biaxial ($2E = 64^\circ$) and that as the percentage of P₂O₅ increases, this angle diminishes, and the pure lead phosphate is uniaxial. *Jannettaz* has obtained similar results (ib., p. 39), and *Jannettaz* and *Michel* (ib., p. 196), have accompanied a more detailed optical study by a series of analyses which add much to the completeness of the investigation.

Anal., Långban, Sweden, by *Kiutarō Iwaya*, quoted by *Lindgren*, Geol. För. Förh., v., 272, 1880. Mina Grande, Marqueza, Chili, *Domeyko*, 6th App., Min. Chili, p. 16, 1878.

Occurrence with vanadinite in Arizona, *Silliman*, Am. J. Sc., III., xxii., 202, 1881; *W. P. Blake*, Min. Sc. Press, Aug., 13, 1881.

See also *Hedyphane*, p. 56.

MIRABILITE, Min., p. 636.—Cryst., Aussee, Upper Austria, v. *Zepharovich*, Lotos, 1877. Anal., Province of Tarapaca, Peru, *Raimondi*, Min. Pérou, p. 288, 1878. Sicily, *Paterno*, Accad. Linc. Trans., III., iv., 22, 1879.

MIRIQUIDITE.—App. II., p. 40.

Mixite. *Schrauf*, Z. Kryst., iv., 277, 1879.

Crystalline to crypto-crystalline. As an incrustation on bismuth ochre, also in irregular particles, granular or spherical, reniform, with partial concentric fibrous structure. The fibres are occasionally distinct six-sided prisms (125°), regarded as probably monoclinic or triclinic (extinction 6° – 9° with prismatic edge). H. = 3–4. G. = 2.66. Color emerald to bluish green; streak somewhat lighter. Translucent to transparent (fine fibres). Analysis:

$\text{As}_2\text{O}_5, (\text{P}_2\text{O}_5)$	Bi_2O_3	CuO	H_2O	FeO	CaO
(3) 30.45	13.07	43.21	11.07	1.52	0.83 = 100.15.

The formula calculated is $\text{Cu}_{20}\text{Bi}_2\text{As}_{10}\text{H}_{14}\text{O}_{70}$; this requires: As_2O_5 31.93, Bi_2O_3 12.99, CuO 44.08, H_2O 11.00 = 100. In dilute nitric acid the mineral is instantly covered with a layer of a brilliant white powder of bismuth arsenate, insoluble in the acid; the copper arsenate goes into solution. On ignition becomes blackish green. Occurs with bismuth ochre, bismutite, and torbernite in the Geistergang at Joachimsthal. Named in honor of Berggrath A. Mixa.

MOLYSITE, Min., p. 118.—Vesuvius, *Scacchi*, Att. Accad. Napoli, vi., 1873 (Contrib. Min., ii., 43).

MOLYBDENITE, Min., p. 32.—Biellese, Italy, *Cossa*, Accad. Linc. Trans., III., i., 206, 1877. Groth suggests that the species may be orthorhombic, Min.-Samml. Strassburg, p. 23, 1878.

MONAZITE, Min., p. 539; App. II., p. 40.—Cryst., Tavetsch, Switzerland (turnerite), *vom Rath*, J. Min., 1876, 393. Binnenthal (turnerite), also optical investigation, *Trechmann*, J. Min., 1876, 593. *Von Kokscharof*, Min. Russl., vi., 387. Ilmen Mts., *von Jeremejev*, Verh. Min. Ges. St. Pet., II., xii., 287. *Seligmann*, Corr. Bl. Nat. Ver. Bonn, xxxvii., 131, 1880. Optical examination, *Des Cloizeaux*, Bull. Soc. Min., iv., 57, 1881.

Analysis, Arendal, G. = 5.174; P_2O_5 29.92, Ce_2O_3 28.82, $\text{La}_2\text{O}_3 + \text{Di}_2\text{O}_3$ 40.79 = 99.53, formula: $[\text{R}_2]\text{P}_2\text{O}_8$, with $[\text{R}_2] = \text{Ce}_2$; $(\text{La}_2\text{Di}_2) = 2:3$; this requires: P_2O_5 30.28, Ce_2O_3 27.72, La_2O_3 , Di_2O_3 42.00 = 100; contains no thorium nor zirconium, *Rammelsberg*, ZS. G. Ges., xxix., 79, 1877. Analysis of turnerite (on .013 gr.): P_2O_5 28.4, Ce_2O_3 (La_2O_3 , Di_2O_3) 68.0 = 96.4, *Pisani*, C. R., lxxxiv., 462, 1877.

Absorption bands (Ce, La, Di) in spectrum (turnerite), *Cossa*, Accad. Linc. Mem., III., 30, 1878.

Occurrence with zircon in gold sands of Ivalo, Finnish Lapmark, *Nordenskiöld*, Geol. För. Förh., ii., 223, 1874. Occurrence in brilliant highly modified crystals, at Milholland's mill, Alexander Co., N. C., also at other localities in North Carolina, *Hüdden*, Am. J. Sc., III., xxii., 21, 1881. From the pegmatite vein at Ännerod, near Moss, Norway, *W. C. Brögger*, Geol. För. Förh., v., 350, 1881. From Nil-St.-Vincent, *Renard*, Bull. Soc. Geol. Belg., III., ii., 128, 1881. See *Microlite*, p. 80.

MONIMOLITE, p. 546; App. II., p. 40.—Occurs at Långban, Wermland, Sweden, *Nordenskiöld*, Geol. För. Förh., iii., 379, 1877.

MONTEBRASITE.—See *Amblygonite*, p. 5.

MONTICELLITE.—Min., p. 255; App. II., p. 40.

MONTMORILLONITE, Min., p. 459.—Anal., Macskamező, near Podu ruoj, Transylvania, *Helmhacker*, Min. Petr. Mitth., ii., 251, 1879. Great Retallack mine, Cornwall, *Collins*,

Min. Mag., ii., 92, 1878. Branchville, Conn., anal. by H. L. Wells, described by *Brush* and *Dana*, Am. J. Sc., III., xx., 283, 1880.

MONZONITE.—App. I., p. 11.

MORDENITE, Min., p. 446.—A partially altered mordenite is called STEELEITE, *How* (Min. Mag., ii., 134, Sept., 1878). Found as red or reddish pink, or chalk-white, balls, varying in size from one to two and a half inches in diameter, imbedded in a red clay in cavities in trap. Also in other forms, closely associated with stilbite. In part soft and chalk-like; in part hard and unaltered. Gelatinizes with acids. Locality Cape Split, 13 miles west of Cape Blomidon, N. S.

MOSANDRITE, Min., p. 295.—Shown to be in fact monoclinic, *Brögger*, Z. Kryst., ii., 275, 1878.

Mottramite. *H. E. Roscoe*, Proc. Roy. Soc., xxv., 111, 1876.

In thin crystalline incrustations, occasionally in distinct, minute crystals, also compact. H. = 3. G. = 5.894. Lustre resinous. Color velvety black; in thin sections yellow. Streak yellow. Translucent. Analyses, *Roscoe* (l. c.): 1; 2, after deducting impurities:

	V ₂ O ₅	PbO	CuO	FeO, ZnO, MnO	MgO	CaO	H ₂ O	
1. (2)	17.14	50.97	19.10	2.52	0.26	2.13	3.63	hygroscopic water 0.22, SiO ₂
2.	18.87	56.12	21.02	....	....	....	3.99	= 100.

The formula suggested is (Pb,Cu)₅V₂O₈ + 2(Cu,Pb)H₂O₂, which requires: V₂O₅ 18.74, PbO 57.18, CuO 20.33, H₂O 3.6 = 100. The composition is thus analogous to dihydrite and erinite [but doubtful, owing to the imperfect analysis; note the loss of 3 p. c.]. Occurs on the Keuper Sandstone, at Alderley Edge, and at Mottram St. Andrews, Cheshire, England.

Muckite. *J. von Schröckinger*, Verh. G. Reichs., 1878, 387.

A resin from the coal beds at Neudorf, Moravia, disseminated in minute particles, and in small bands. Color opaque yellow, or light brownish yellow, and transparent to translucent. H. = 1-2. G. = 1.0025. An analysis by *Dietrich* gave: (1) C 79.22, H 9.57, O 11.21, corresponding to C₂₆H₁₈O₃. Fuses between 290° and 310°. In alcohol, 14 p. c., dissolves; in ether, 40 p. c., both leaving a yellowish-brown residue. Other similar experiments prove that the substance is a mechanical mixture of different resins.

MUSCOVITE.—See *Mica Group*, p. 77.

MYSORIN, Min., p. 715.—From the Nellore district, India. Examined by *F. R. Mallet*, and shown to be essentially an impure malachite, with 9.02 H₂O; it contained as impurities, calcite, chrysocola, barite, chalcocite, iron sesquioxide, Rec. Geol. Surv. India, xii., 166, 1879.

NADORITE.—App. I., p. 11.

NÆSUMITE.—App. I., p. 11.

NAGYAGITE, Min., p. 82.—*Schrauf* (Z. Kryst., ii., 239, 1878) shows that the crystalline system is not tetragonal, but either orthorhombic or perhaps still lower in symmetry. *Fletcher* observes the development of the planes to be in accordance with orthorhombic symmetry (Phil. Mag., V., ix., 188, 1880).

NAMAQUALITE.—App. I., p. 11.

NANTOKITE.—App. I., p. 11; II., p. 40.

NATROLITE, Min., p. 426; App. II., p. 41.—**Cryst.**, Salesel, Bohemia, *Seligmann*, Z. Kryst., i., 338, 1877. Auvergne, *Lüdecke*, Z. gesamt. Nat., III., iv., 145, 1879. Arø, Norway, *Brögger*, Z. Kryst., iii., 478, 487, 1879.

According to *Lüdecke* (J. Min., 1881, ii., 7), the natrolite from Aussig and Salesel must, on optical grounds, be referred to the monoclinic system. See *Lüdecke's* memoir also, on the relation of natrolite to scolecite and mesolite.

Pyro-electrical characters, *Hankel*, Wied. Ann., vi., 55, 1879.

Analyses, Kuchelbad, near Prague, *Preis* and *Vrba*, Ber. Ges. Böhm., 1879, 469.

NATRON, Min., p. 705.—Analyses of related salts quoted by *Brackebusch*, Min. Argentina, p. 70, 1879.

NEFIEDIEFFITE.—App. II., p. 41.

Neochrysolite.—See *Chrysolite*, p. 27.

Neociano—**NEOCYANITE**. *Scacchi*, Rend. Accad. Napoli, Jan., 1881.

In extremely minute tabular monoclinic crystals. Color blue. Supposed to be an anhydrous copper silicate. B. B. fuses to a black glass. Easily decomposed by acids, with the separation of pulverulent silica. From fumaroles at Vesuvius, formed by sublimation, together with three other substances. One of these forms a white granular mass, G. = 2.287, probably silica. A second is a white asbestos-like material, containing lime; difficultly fusible, and decomposed only in boiling acid. The other forms yellowish-brown crystals in six-sided rhombic plates; insoluble in acid. [Needs further examination.]

NEPHELITE, Min., p. 327; App. II., p. 41.—**Cryst.** ($O \wedge 1 = 136^\circ 9' 20''$), Albani Mts., near Rome, *Sella*, Z. Kryst., i., 240, 1877. Island of Laaven, Langesundfiord, Norway, (*eläolite* in *eläolite-syenite*, $O \wedge 1 = 136^\circ$), *Klein*, J. Min., 1879, 534.

Made artificially, *Fouqué* and *Lévy*, C. R., lxxxvii., 961, 1878.

Alteration products in nephelite rocks, v. *Eckenbrecher*, Min. Petr. Mitth., iii., 1, 1880.

Analyses, Ditró, Transylvania (*eläolite*), *A. Koch*, Min. Mitth., 1877, 335. Vesuvius, G. = 2.600-2.609, *Rammelsberg*, ZS. G. Ges., xxix., 78, 1877. Vesuvius, *Rauff*, Z. Kryst., ii., 445 et seq., 1878. In foyate of the Sierra de Monchique, Southern Portugal, *Scheibner*, Q. J. G. Soc., 1879, 46, quoted by van Wervecke, J. Min., 1880, ii., 143. Ditró, Transylvania (*eläolite*), *A. Koch* (anal. by Franz Koch), J. Min., Beil.-Bd., i., 143, 1880.

The chemical composition of nephelite is discussed by *Rammelsberg* (l. c.) and *Rauff* (l. c.). The former deduces the formula: $R_6[Al_2]_2Si_2O_{26} = 5(Na_2[Al_2]Si_2O_8) + K_2Al_2Si_2O_{12}$; the latter obtains: $R_7[Al_2]_4Si_2O_{34} = 7R_2[Al_2]Si_2O_8 + R_2[Al_2]Si_2O_{12}$. *Rauff* seems to prove, contrary to *Rammelsberg*, that the pure mineral contains some CaO (1.32-1.76 p. c.), and perhaps also a little basic water (0.12-0.14 p. c.) and a trace of chlorine. *Rauff* also discusses the relation of nephelite (and *eläolite*) to cancrinite and *microsommitte*.

NEPHRITE, Min., p. 233, et al.; App. II., p. 41.—**Analyses** of specimens from New Zealand, *Berwerth*, Ber. Ak. Wien, lxxx., 102, 1879 (see also J. Min., 1880, i., 170 (ref.), and 1881, i., 99). Several analyses quoted by *Fischer*, Z. Kryst., iii., 592, 1879. Siberia (= tremolite), *Jannetaz* and *Michel*, Bull. Soc. Min., iv., 178, 1881.

For a general and detailed discussion of nephrite and jadeite, in all their relations, but especially archaeological, see the works of *Fischer*, whose titles are given in the Bibliography (see Introduction); noticed in J. Min., 1876, 218, and 1880, ii., 319 (ref.); also *ib.*, 1880, ii., 113. See also Annual Rep. Smithsonian Inst., 1876, 402.

Neudorfite. *J. von Schröckinger*, Verh. G. Reichs., 1878, 387.

A resin occurring in a coal bed at Neudorf, Moravia. Color pale yellow. Lustre waxy. Fracture conchoidal. G. = 1.045-1.060. An analysis by *Dietrich* gave: C 78.04, H 9.84, O 11.93, N 0.14, corresponding to $C_{18}H_{28}O_2 = C 78.26$, H 10.14, O 11.60 = 100. Fuses at 280°. Dissolves in ether, leaving a whitish-yellow resinous powder.

Newberyite. *G. vom Rath*, Ber. nied. Ges. Bonn, Jan. 13, 1879; Bull. Soc. Min., ii., 81, 1879.

Orthorhombic; axes, *c* (vert.): *b*: *a* = 0.9300:1:0.9435. Observed planes: *i*- \bar{i} , *i*- \bar{i} , *O*, $\frac{1}{2}$ - \bar{i} , 2- $\bar{2}$, 1. Angles: $O \wedge \frac{1}{2}$ - $\bar{i} = 153^\circ 46'$, $O \wedge 1 = 126^\circ 26'$, $1 \wedge 1 = 108^\circ 22'$. In large (1 sq.

in.) tabular crystals. Cleavage $i-\lambda$, perfect; basal imperfect (v. Rath). Optic axes in the brachydiagonal section. Acute bisectrix (+) normal to the base. Dispersion considerable $\rho < v$. $2H_a = 44^\circ 46'$ (red), $2H_o = 142^\circ 8'$ (red), Des Cloizeaux.

Analysis, MacIvor :

P_2O_5	$MgO(MnO \text{ tr.})$	H_2O	
41.25	[23.02]	35.73	= 100.

Formula : $Mg_2H_2P_2O_8 + 6aq = P_2O_5 \text{ 40.80, } MgO \text{ 22.99, } H_2O \text{ 36.21} = 100$. Loses its water about $110^\circ C$. Easily soluble in acids. From the guano in the Skipton Caves, Victoria; first recognized as new by Ulrich (in a letter to vom Rath). Named after Mr. J. C. Newbery, of Melbourne.

Niccocchromite. *C. U. Shepard*, Min. Contr., 1877. A canary-yellow substance, occurring as a coating on zarafite, rarely on chromite, at Texas, Pa. On the ground of a partial blowpipe examination, it is concluded to be a "dichromate of nickel" (?).

NICCOLITE, Min., p. 60; App. II., p. 41.—**Anal.**, Colorado de Chañarcillo, Chili, *Domeyko*, 3d ed. Min. Chili, p. 185, 1879.

NIGRESCITE.—App. I., p. 12.

NIOBITE.—See *Columbite*, p. 29.

Nitrobarite. *Groth* (Z. Kryst., vi., 195, 1881) has described crystals of barium nitrate (barytsalpeter), from Chili. They are in apparent octahedrons, formed of the + and - tetrahedrons; also in spinel-like twins. According to Wulff (ib., iv., 122), the species is tetartohedral. The crystals are colorless, in part covered with a thin brownish-black coating resembling wad. Exact locality unknown. H. C. Lewis (Amer. Naturalist, xvi., 78, 1852) has proposed the name NITROBARITE for the species.

NITROGLAUBERITE.—App. II., p. 41.

Nocerina—**NOCERITE**. Announced by *Scacchi* in a preliminary note (Accad. Line. Trans., III., v. 270, 1881), as occurring in volcanic bombs in the tufa of Nocera. In white acicular crystals, referred to the rhombohedral system. In composition regarded as a double fluoride of calcium and magnesium. Associated with fluorite, some brown crystals referred to amphibole, and minute crystals in hexagonal prisms, perhaps a variety of microsommite. The exterior of the bombs is covered with mica.

NOHLITE.—App. II., p. 41.

NOBSITE.—Min., p. 333; App. II., p. 42.

NOUMEAITE, NOUMEITE, NUMEITE.—See *Garnierite*, p. 50.

OCTAHEDRITE, Min., p. 161; App. II., p. 41.—**Cryst.**, Memoir, Lercheltini Alp, Binnenthal (wiserine), *Klein*, J. Min., 1875, 337. Cavradi, Tavetsch, vom Rath, Ber. Ak. Berlin, 1875, 536 (Pogg. Ann., clviii., 402, 1876). Wettin, *Lüdecke*, Z. gesamt. Nat., III., iii., 394, 1878. Tavetsch, Brazil, etc., *Groth*, Min.-Samml. Strassburg, p. 108, 1878. Binnenthal, v. *Zepharovich*, Lotos, 1880. *Seligmann*, J. Min., 1881, ii., 269. Rauris, Salzburg, *Vrba*, Z. Kryst., v., 417, 1881.

Occurrence in nearly colorless transparent crystals, Brindletown, Burke Co., N. C., *Hidden*, Am. J. Sc., xxi., 160, 1881. In quartz at Nil-St.-Vincent, *de Koninck*, Bull. Ac. Roy. Belg., II., xlv., 245, 1878.

Mallard (Ann. Min., VII., x., 127, 1876) describes the optical peculiarities of crystals from Brazil, and decides upon the monoclinic character of the fundamental individuals. See also *Brookite*, p. 18.

CELLACHERITE, Min., p. 489.—Habachthal, Salzburg. Occurrence in mica schist (anal. by F. Bergmann), *Sandberger*, J. Min., 1875, 624; *ib.*, 1879, 367. See also *Mica Group*, p. 77.

OKENITE.—Min., p. 398; App. II., p. 41.

OLDHAMITE.—App. II., p. 41.

OLIGOCLASE, Min., p. 346; App. II., p. 41.—Cryst., Antisana, Andes, *von Rath*, ZS. G. Ges., xxvii., 301, 1875; Bodenmais, Z. Kryst., iv., 431. Mt Gibebe, Pantellaria, *Förstner*, Z. Kryst., i., 551, 1877. *Klein*, J. Min., 1879, 518. *Des Cloizeaux*, Bull. Soc. Min., iii., 157, 1880.

Anal., Dürrmorsbäch, *Haushofer*, Z. Kryst., iii., 602.
See also *Feldspar Group*, p. 45.

OLIVINE.—See *Chrysolite*, p. 27.

OMPHACITE, Min., p. 223.—See *Pyroxene*, p. 100.

ONOFRITE, Min., p. 56.—From Marysvale, Southern Utah. Observed by *Newberry*, and described by *Brush* (Am. J. Sc., III., xxi., 312, 1881), as follows: Massive, without cleavage. H. = 2.5. G. = 7.62. Lustre metallic, brilliant on the fresh fracture. Color and streak blackish gray. Fracture conchoidal. Analysis by *Comstock*:

	Se	S	Hg	Zn	Mn	
($\frac{2}{3}$)	4.58	11.68	81.93	0.54	0.69	= 99.42.

Formula essentially Hg(S,Se), with S:Se = 6:1, corresponding nearly with the onofrite of *Haidinger*, which has, according to *H. Rose*, S:Se = 4:1; with which it also agrees in physical characters.

Brush gives an historical statement as to the occurrence of American mercuric sulphoselenides. He also calls attention to the essential identity of *guadalcazarite* of *Petersen* (App. II., p. 25, also *Rammelsberg*, Min. Chem., 1875, p. 79) with the *metacinnabarite* or black mercuric sulphide of *Moore* (App. I., p. 10), and shows that *metacinnabarite*, HgS, G. = 7.72, *onofrite* (Utah), 6HgS + HgSe, G. = 7.62 (calculated 7.64), *onofrite* (San Onofre), 4HgS + HgSe, and *tiemannite*, HgSe, G. = 7.27, undoubtedly form an isomorphous series. The specific gravity given in *Dana's Min.*, p. 56, for onofrite (5.56) is incorrect; that number belongs to a gray mineral of doubtful character also mentioned by *Del Rio* (see *Brush*, l. c.).

A mineral partially described by *D'Achiardi* as a ferriferous variety of *guadalcazarite*, is provisionally called *LEVIGLIANITE* by him. A qualitative examination showed that it contained no selenium, and more zinc and iron than the original mineral. From the mercury mine of *Levigliani*, near *Seravezza*, in the Apuan Alps, Italy, Att. Soc. Tosc., ii., 112, 1876.

Ontariolite.—See *Scapolite*, p. 106.

OPACITE.—App. II., p. 41.

OPAL, Min., p. 198; App. II., p. 42.—Artificial opal, *Bertrand*, Bull. Soc. Min., iii., 57, 1880.

Formation of vein opal in the andesite of the *Gleichenberg*, *Kispatic*, Min. Petr. Mitth., iv., 122, 1881.

A variety of opal from Mt. *Blackmore*, Montana, has been called *BLACKMORITE* by *Peale*, *Hayden's Report*, 1872, p. 169.

ORILEYITE.—App. I., p. 12.

ORPIMENT, Min., p. 27.—Occurrence in the trachytic region of Tolfa, Rome, *Sella*, Trans. Accad. Linc., III., i., 66, 1877. In Iron Co., Utah, *W. P. Blake*, Am. J. Sc., III., xxi., 219, 1881.

ORTHITE, Min., p. 285; App. II., p. 42.—**Cryst.**, Auerbach, in granular limestone, *vom Rath*, Ber. nied. Ges. Bonn, Jan. 3, 1881.

Microscopic examination of specimens from different localities, *A. Sjögren*, Geol. Föhr. Förh., iii., 258, 1877.

Discussion of composition with many analyses, *Engström*, Inaug. Diss. Upsala, 1877 (Z. Kryst., iii., 191, 1878). A much altered orthite (12 to 14 p. e. H₂O), blackish brown to red, is called *VASITE* by Engström.

Slättåkra, analysis by Cedervall and Jönsson, *Blomstrand*, Minneskrift Fys. Sällsk. Lund, 1878, p. 3.

ORTHOCLASE, Min., p. 352; App. II., p. 42.—**Cryst.**, Bellingin, Westerwald (sanidine), *v. Rath*, Pogg. Ann., clviii., 400, 1876. Cornwall, penetration twins (tin oxide pseudomorph), *Laspeyres*, Z. Kryst., i., 204; i., 344, 1877. Albani Mts. (sanidine), *Sella*, Z. Kryst., i., 243, 1877. Fichtelgebirge, twins, *Haushofer*, Z. Kryst., iii., 601, 1879. Warmbrunn, Silesia, twins, *Klockmann*, ZS. G. Ges., xxxi., 421, 1879. Dissentis, *vom Rath*, Z. Kryst., v., 492, 1881.

Relation between orthoclase and microcline, *Mallard* (Ann. Min., VII., x., 1876); he regards them as essentially identical.

Thermo-electrical characters, *Hankel*, Wied. Ann., i., 279, 1877. Expansion on heating, *Beckenkamp*, Z. Kryst., v., 452, 1881.

Pseudomorphs after cassiterite, *Phillips*, J. Ch. Soc., Aug., 1875 (and see above).

Made artificially, *Hautefeuille*, C. R., lxxxv., 952, 1877, and xc., 830, 1880; *Fouqué* and *Lévy*, C. R., lxxxvii., 700, 830, 1878; *Meunier*, C. R., lxxxvii., 737, 864, 1878; *Friedel* and *Sarasin*, C. R., xciii., 1374, 1881 (Bull. Soc. Min., iv., 171).

See also *Feldspar Group*, p. 45, and *Microcline*, p. 80.

Oryzite (Orizite). *Grattarola*, Att. Soc. Tosc., iv., 226, Nov. 9, 1879.

In minute crystals, 1 to 3 mm. long, and 1 to 1.5 mm. thick. Prismatic with $I \wedge I = 134^\circ - 138^\circ$; $1-\bar{1} \wedge 1-\bar{1} = 147^\circ$. Triclinic, according to Grattarola, but the measurements are stated to be approximate only, and those given are not sufficient to determine the form. H. = 6. G. = 2.245. Lustre vitreous to pearly. Color and streak white. Analyses:

	SiO ₂	Al ₂ O ₃	CaO	H ₂ O	
1.	59.54	16.79*	8.67	14.84	MgO, alkalis tr. = 99.84.
2.	59.20	15.71	10.31	14.38,	" " " = 99.60.

* With some CaO.

Soluble in warm HCl, with the separation of gelatinous silica. B. B. swells up "and fuses easily." Named from *ορυζα, rice*, in allusion to the similarity of the crystals to rice grains. [Groth (Z. Kryst., iv., 641) calls attention to the similarity to heulandite in form and composition (with which the author regards it as being dimorphous), and justly remarks that the description is not sufficiently complete to establish its independence.] From the granite blocks in the Foresi collection, which have popularly gone by the name of the "Four Evangelists," and which formed part of the granitic vein of the "Masso Foresi," or Fonte del Prete, Elba. The same source has yielded tourmaline, beryl, castorite, pollucite, apatite, etc.

OSBORNITE.—App. I., p. 12.

OTTRELITE, Min., p. 506; App. II., p. 43.—A variety of ottrelite is called *VENASQUITE* by Damour (see *Bourbée*, Bains et courses de Luchon, 1857, and *Damour*, Bull. Soc. Min., ii., 167, 1879). Occurs in masses having a lamellar and radiated crystalline structure. Cleavage in one direction. H. = 5.5. G. = 3.26. Color grayish black. Streak gray. Opaque. Analysis, Damour, l. c.:

SiO ₂	Al ₂ O ₃	FeO	MgO	H ₂ O	
44.79	29.71	20.75	0.62	4.93	= 100.80.

This corresponds closely with the formula $(\text{Fe}, \text{Mg})[\text{Al}_2]\text{Si}_3\text{O}_{10} + \text{aq}$. B. B. fusible with difficulty on thin edges; yields a magnetic slag on charcoal. Not attacked by acids. From Vénasque, in the Pyrenees.

OXAMMITE. A name given by Shepard (App. I., p. 6) for crystals supposed to be ammonium oxalate, from the guano of the Guanape Islands. *Raimondi*, under the name of GUANAPITE, has described (Min. Pérou, pp. 30, 33, 1878) what is apparently the same substance examined by Shepard. Occurs in small flattened (4 to 5 mm. long) grains, with lamellar structure. Sometimes in elongated prismatic (orthorhombic) crystals; also pulverulent. Color yellowish white. Lustre silky. Transparent. Inodorous. Volatilizes completely with heat. An oxalate of ammonia. Found with mascagnite, which it much resembles, in the guano of the Guanape Isles.

J. A. Tanner, Jr. (Chem. News, xxxii., 102, 1875), has analyzed the Guanape mineral, and obtained (after deducting 5.54 p. c. organic matter): NH_4 , 21.95, C_2O_4 , 53.30, H_2O 24.75, corresponding to $\text{C}_2(\text{NH}_4)_2\text{O}_4 + 2\text{aq}$, which requires: NH_4 , 22.50, C_2O_4 , 55.00, H_2O 22.50. [Raimondi's name is based on a partial description, Shepard's name on a mere statement in a single sentence; as, however, the name guanapite has been previously used (App. I., p. 6), the other, though not free from objection, may be accepted.]

OZOCERITE, Min., p. 732; App. II., p. 43.—Description of a related mineral wax from Utah, *Newberry*, Am. J. Sc., III., xvii., 340, 1879.

From Kinghorn-ness, Scotland, anal., *Macadam*, Rep. Brit. Assoc., 1879, 309, or Ch. News, xl., 48, 1879. Galicia, *Paul*, Verh. G. Reichs., 1881, 131.

PACHNOLITE, Min., p. 129.—According to *Groth* (Tab. Uebers. Min., 41, 1882), the true relation of the species pachnolite and thomsenolite has been recently established by Brandl. PACHNOLITE is monoclinic, with $\beta = 89^\circ 40'$, and c (vert.): $b : a = 1.5:20 : 1:1.1626$, and has the composition $[\text{Na}, \text{Ca}]\text{F}_3 + \text{Al}_2\text{F}_6$. It is consequently a cryolite, with two sodium atoms replaced by one calcium atom.

THOMSENOLITE, on the same authority, is monoclinic, with $\beta = 89^\circ 37\frac{1}{2}'$, and c (vert.): $b : a = 1.0877 : 1.09959$; and has the composition $[\text{Na}, \text{Ca}]\text{F}_3 + \text{Al}_2\text{F}_6 + \text{H}_2\text{O}$.

On earlier discussions of the relations of these species, see: *Knop*, Ann. Ch. Pharm., cxxvii., 61, 1866; *Wöhler*, J. Min., 1876, 58; *König*, Proc. Ac. Nat. Sc. Philad., 1876, 42; *Krenner*, J. Min., 1877, 504; *Klein*, J. Min., 1877, 808. PYROCONITE of *Wöhler* is the same as var. A pachnolite of Knop.

PALAGONITE, Min., p. 483; App. II., p. 43.—*Penck*, after an exhaustive study of many so-called palagonite rocks, concludes that no such mineral exists; that most of the material, which has received that name and been examined, is a mixture of different substances, consisting largely of the glassy ejected bombs from a basaltic magma, ZS. G. Ges., xxxi., 504, 1879.

Pandermite.—See *Priceite*, p. 97.

PARAGONITE.—Min., p. 487; App. II., pp. 43, 63.—See also *Cossaite*, App. II., p. 63.

Parailmenite. Same as the doubtful paracolombite (Min., p. 143), from Taunton, Mass., *C. U. Shepard*, Am. J. Sc., III., xx., 56, 1880.

Parankerite.—See *Ankerite*, p. 6.

PARASTILBITE.—See *Epistilbite*, p. 42.

PARISITE, Min., p. 702.—Absorption bands in spectrum (Ce, La, Di), *Cossa*, Accad. Linc. Mem., III., iii., 29, 1878. See also *Bastnäsit*, under Tysonite, p. 126.

Paroligocalse. PAROLIGOKLAS. *E. E. Schmid*, Jenaer. Denksch., 1880 (J. Min., 1881, i., 78 ref.).

A problematical substance occurring in indistinct prisms, with calcite grains, imbedded in the ground-mass of a rock found between Ilmsenberg, Quäriberg, and Silberberg, in the Thüringerwald. The rock has a specific gravity of 2.666–2.677, and in thin sections shows

an opaque ground-mass of ferrite, with the macroscopic prisms of a pale yellow color. Extinction parallel and perpendicular to the axis of prism.

Analyses: (1) of rock entire; (2) portion soluble in dilute HCl; (3) soluble in concentrated HCl; (4) insoluble remainder.

	SiO ₂	Al ₂ O ₃ *	Fe ₂ O ₃ †	CaO	MgO	Na ₂ O	K ₂ O	CO ₂	ign.
1.	45·74	16·07	14·74	6·31	2·73	2·97	4·71	4·32	2·22 = 99·01.
2.	....	0·66	2·37	6·31	0·22	0·28		4·32	0·28 = 14·44.
3.	4·59	2·08	11·10	....	1·24	0·19	0·09	....	.... = 19·29.
4.	41·15	13·33	1·27	....	1·27	2·66	4·46	....	4·60 = 64·60.

* With P₂O₅.

† With TiO₂ and Mn₂O₃.

The author gives for the ratio in the insoluble part of RO: Al₂O₃: SiO₂ = 0·94: 3: 8·90 = 1: 3: 9, and calls the mineral *paroligoclase*, in allusion to the fact that this is the ratio of oligoclase. [Rosenbusch (J. Min., l. c.) suggests that the substance may belong to the scapolite group; in any case, on the basis of so imperfect an examination, it has no claim to a place as a mineral species, and should never have received a name.]

PARTZITE, Min., p. 188.—*Anal.*, Mine of San Lorenzo, province of Huaylas, and mine des Italiens, province of Cajatambo, Peru, *Raimondi*, Min. Pérou, pp. 83, 86, 87, 1873.

Passyite.—See *Quartz*, p. 101.

PATTERSONITE.—Min., p. 801; App. I., p. 18; II., p. 43.

PEALITE.—App. II., p. 43 (24).

Peckhamite. *J. L. Smith*, Am. J. Sc., III., xix., 462; xx., 136, 1880.

Occurs in rounded nodules in the meteorite of Emmet Co., Iowa. Shows a more or less distinct cleavage. G. = 3·23. Lustre greasy, opalescent. Color light greenish yellow. Two analyses (1) on 0·1 gr., (2) on 0·35 gr., gave:

	SiO ₂	FeO	MgO
1.	49·50	15·88	33·01 = 98·39.
2.	49·59	17·01	32·51 = 99·11.

These correspond to R₂Si₂O₁₀, which Smith resolves into 2(RSiO₂) + R₂SiO₄, that is, 2 molecules of enstatite and 1 of chrysolite. Named after Prof. S. F. Peckham.

PECTOLITE, Min., p. 396; App. II., p. 43.—A mineral, very near pectolite, is called WALKERITE by *Heddle* (Min. Mag., iv., 121, 1880). In radiating and interlacing fibres, resembling ordinary pectolite. H. = 4·5. G. = 2·712. Cream-colored, slightly pinkish. Lustre brilliant, pearly. Phosphoresces on being broken, or on application of heat. Analyses: 1, Walker (anal. 10, Dana, Min., p. 397); 2, 3, Heddle:

	SiO ₂	Al ₂ O ₃	FeO	CaO	MgO	K ₂ O	Na ₂ O	H ₂ O
1.	54·00	....	....	30·79	2·59	....	5·55	5·43 = 98·36.
2.	53·22	0·9	0·21	26·18	6·81	undet.		5·23.
3.	52·20	....	1·33	23·61	5·12	0·85	6·50	5·28 = 99·92.

Calculated formula: Na₂MgCa₄Si₂O₂₀, 2H₂O or H₂Na₂MgCa₄Si₂O₂₁ + aq, requiring: SiO₂ 53·71, CaO 28·65, MgO 5·12, Na₂O 7·92, H₂O 4·60 = 100. Found in the diabase of Corsorphine Hill, near Edinburgh, Scotland. Described by the early English mineralogist, Dr. Walker, as pectolite, after whom it is named. [The difference from pectolite is so small as not to seem to require its separation.]

PEGANITE.—See *Variscite*, p. 128.

Pelagite. *A. H. Church*, *Min. Mag.*, i., 50, 1876; *Gümbel*, *Ber. Ak. München*, 1878, p. 189.

A name given by Church (l. c.) to the manganese nodules obtained by the "Challenger" from the bottom of the Pacific, between Japan and the Sandwich Is., at a depth of 2740 fathoms. Characters, as follows: H. = 3.5. G. = 1.89. Color brownish black. Streak somewhat shining. Powder between blackish brown and clove brown. Fracture conchoidal; fragile. In the closed tube gives off water having a slight alkaline reaction. B. B. contracts, becomes black, and fuses on the edges. With HCl dissolves with the liberation of chlorine and separation of silica. The nodules have a concretionary structure, consisting of concentric layers, and having a core of indurated red clay, and, in one case, of punice; the material was regarded as homogeneous. *Gümbel* (l. c.) describes nodules from the same source. Analyses: (1) Church; (2) Schwager (quoted by *Gümbel*).

	SiO ₂	MnO ₂	Al ₂ O ₃	Fe ₂ O ₃	H ₂ O	
1.	10.37	30.22	3.30	20.02	34.55*	Cl 0.71, MgO, CaO, CuO, Na ₂ O, Cl, P ₂ O ₅ , etc., 0.83 [= 100.]
2.	16.03	23.60	10.21	27.46	17.82	MgO 0.18, CaO 0.92, CuO 0.02, CoO, NiO 0.01, [BaO 0.01, Na ₂ O 2.36, K ₂ O 0.40, TiO ₂ 0.66, Cl 0.94, P ₂ O ₅ 0.02, SO ₃ 0.48, CO ₂ 0.05 = 101.17.]

* At a red heat 10.0 p. c.

Other analyses by *J. Y. Buchanan* (*Proc. Roy. Soc. Ed.*, ix., 287, 1877; *Ch. News*, xliv., 253, 1881) of specimens from different localities, show a wide variation in composition (24.4-35.3 MnO₂ and 18-24.8 Fe₂O₃). [Although great interest attaches to these nodules, they cannot in any sense claim to be a distinct mineral species, but are doubtless composite.]

Pelagosite. *K. Moser*, *Tschermak, Min. Petr. Mitth.*, i., 174, 1878.

A substance occurring as a thin, dark-colored incrustation on limestone and dolomite, on the shores of the Mediterranean, as at the Island of Pelagosa (*Moser*). In some cases looking like varnish, and again resembling lichens. It consists of thin translucent layers, exerting on polarized light the effect of aggregate polarization. An analysis by *J. Cloëz* on similar material from Cape Ferrat, afforded: CaCO₃ 91.80, MgCO₃ 0.90, Fe₂O₃ 0.25, SiO₂ 1.22, NaCl 0.49, H₂O 4.56, organic matter 0.71 = 99.93. It is regarded as produced by the action of sea-water on the dolomite.

Des Cloizeaux and *Vélain* have observed similar coatings on the feldspathic rocks of Corsica, on the coast of Oran, and on basaltic lava on the coast of Réunion Island, *Bull. Soc. Geol.*, vi., 86, 1878. [Not a mineral species.]

Pelhamine. *C. U. Shepard*, *Contr. Min.*, 1876.—A serpentinous substance (altered asbestos), forming irregular seams and masses at the asbestos mine, at Pelham, Mass., resembling a black serpentine. Color dark greenish gray. H. = 5. G. = 2.9-3.2. B. B. infusible. Analysis: SiO₂ 33.40, Al₂O₃ 2.80, FeO 15.52, MgO [39.88], H₂O 3.40 = 100.

PENCATITE.—*Min.*, p. 708; *App. II.*, p. 43 (45).

PENNINITE, *Min.*, p. 495; *App. II.*, p. 43.—*Mallard* (*Ann. Min.*, VII., x., 151, 1876) regards penninite (uniaxial) and clinocllore, or ripidolite (biaxial), as identical, both having a fundamental monoclinic form, but differing only in the method of grouping of the individuals. He calls attention to cases where a biaxial chlorite encloses a nucleus of a uniaxial chlorite, and explains the latter by the aggregation analogous to corundum.

Analyses of penninite, ripidolite, and related species from Scottish localities, *Hedde*, *Trans. Soc. Edinb.*, xxix., 55 et seq., 1879. Anal. (by *van Wervecque*), pseudophite, *Mar-kirch*, *Vosges*, *Groth*, *Z. Kryst.*, i., 509, 1877.

Penwithite. *J. H. Collins*, *Min. Mag.*, ii., 91, 1878; iii., 89, 1879.

Massive. H. = 3.5. G. = 2.49. Lustre vitreous. Color dark amber to reddish brown. Transparent. Fracture conchoidal. Brittle. Analysis: (3) SiO₂ 36.40, MnO 37.62, FeO 2.52, H₂O 21.80, MnO₂ tr., U₂O₃ 0.30, Cu tr. = 98.64. Formula calculated by author: MnSiO₃ + 2aq, requiring: SiO₂ 35.9, MnO 42.5, H₂O 21.5 = 100. B. B. fuses with difficulty. Occurs with quartz and rhodochrosite, in the district of Penwith (whence name), West Cornwall. [The author mentions, that if the coarse powder is digested in HCl, the manganese is dissolved out and the silica left colorless; he also mentions related sub-

stances with SiO_2 , varying from 22 to 57 p. c., and G. as high as 3.4. It would seem, consequently, very doubtful whether this is to be regarded as a true mineral species.]

PERCYLITE, Min., p. 122; App. II., p. 43.—Believed to occur at Mina San Rafael, Gale-ria al Norte, Bolivia, *Gregory*, Min. Mag., ii., 251, 1879. Mt. de Challacollo, Tarapaca, Peru, *Raimondi*, Min. Pérou, p. 174, 1878.

PEROFKITE, Min., p. 146; App. II., p. 43.—Occurrence as a microscopic constituent of nephelite-pikrite, in Bohemia, *Borický*, Ber. Böhm. Ges., Oct. 13, 1876, p. 227. From the Val Malenco (anal. by Mauro), *Strüver*, Trans. Accad. Linc., III., iv., 210, 1880.

The question of the crystalline system of perofskite has been discussed by *von Kokscharof*, Min. Russl., vi., 388, 1874; vii., 375, 1878; viii., 39, 1881 (J. Min., 1878, 38); *Des Cloizeaux*, ZS. G. Ges., xxvi., 932, 1874; J. Min., 1877, 160; ib., 1878, 43, 372; *Baumhauer*, Z. Kryst., iv., 187, 1879. The etching experiments of Baumhauer, supported by optical examinations, seem to prove that, as urged by von Kokscharof and accepted by Des Cloizeaux, the mineral is orthorhombic, and owes its form and optical properties to a complicated system of twinning.

An altered perofskite from Magnet Cove, Arkansas, is called **HYDROTITANITE** by *König* (Acad. Nat. Sci. Philad., 82, 1876). Color yellowish gray. G. = 3.681. Soft. An analysis afforded: TiO_2 82.82, Fe_2O_3 7.76, MgO 2.72, CaO 0.80, H_2O 5.50, V tr. = 99.60. [Indeterminate decomposition products are not mineral species.]

PETALITE, Min., p. 229; App. II., p. 43.—Anal., Elba, *Rammelsberg*, Ber. Ak. Berlin, 1878, 9. Discussion of chemical composition and relation to spodumene, *Düller*, Min. Petr. Mitth., i., 529, 1878.

An alteration product of castorite, from Elba, has been called **HYDROCASTORITE** by G. Grattarola (Boll. Com. Geol., 1876, 323). Occurs as a mealy aggregate of fine crystalline needles, surrounding a nucleus of the original mineral. The microscopic prismatic crystals sometimes obliquely cut off (70°); extinction parallel the prism. H. = 2. G. = 2.16. Color white. Analyses: 1, Grattarola, on material not entirely pure; 2, Sansoni (Att. Soc. Tosc., iv., 320, 1879).

	SiO_2	Al_2O_3	CaO	MgO	H_2O	
1.	59.59	21.35	4.38	....	14.66	= 99.98.
2.	58.13	19.70	4.17	0.50	15.96	= 98.46.

For the latter the not very simple formula: $\text{Ca}_2[\text{Al}_2]_6\text{Si}_6\text{O}_{60} + 24\text{aq}$, is calculated. [Needs further examination.]

PETZITE.—Min. p. 146; App. II., p. 43; see also *Hessite*, App. III., p. 58.

Phäactinite.—See *Amphibole*, p. 5.

PHARMACOLITE, Min., p. 554; App. II., p. 43.—Cryst., *Schrauf*, Z. Kryst., iv., 284, 1879.

PHARMACOSIDERITE, Min., p. 578.—From Schemnitz, Hungary, Min. Mitth., 1875, 109. From Garonne, Dept. du Var, *Pisani*, C. R., lxxxiv., 1512, 1877.

Pseudo-isometric, according to *Bertrand*, Bull. Soc. Min., iv., 256, 1881.

PHENACITE, Min., p. 263; App. II., p. 43.—Cryst., with catalogue of observed planes, *Seligmann*, J. Min., 1880, i., 129. From Switzerland, perhaps Val Giuf, *Websky*, Ber. Ak. Berlin, 1880, 1007.

Anal., Cerro del Mercado, Durango, Mexico, *Chrustschoff*, Z. Kryst., iii., 634, 1879.

Phengite.—See *Mica Group*, p. 77.

Philadelphite.—See *Vermiculite*, p. 129.

Phillipite. *I. Domeyko*, 5th Appendix Min. Chili, 1876; 3d ed. Min. Chili, p. 248, 1879.

Compact, granular, or with fibrous structure, transverse to veins in the chalcopyrite. Lustre vitreous. Color azure blue. Translucent, astringent. Composition approximately given by the formula, $\text{CuSO}_4 + [\text{Fe}_2]\text{S}_2\text{O}_{12} + \text{naq.}$ Analysis gave: SO_3 28.96, Fe_2O_3 9.80 (iron subsulphate 2.28), CuO 14.39, MgO 0.85, H_2O 43.72, Al_2O_3 tr. = 100. Soluble in water, but unaffected by exposure to the air. Found at the copper mines in the Cordilleras of Condes, province of Santiago, Chili. Produced from the decomposition of chalcopyrite, and found in small irregular masses and bands with it in an argillaceous ochre.

PHILLIPSITE, Min., p. 438; App. II., p. 43.—Crystalline system monoclinic, with a higher degree of pseudo-symmetry, due to repeated twinning, analogous to harmotome, *Streng*, J. Min., 1875, 585; *Trippke*, ZS. G. Ges., xxx., 178, 1878 (or J. Min., 1878, 681, 830); *Fresenius*, Z. Kryst., iii., 42, 1879; v. *Zepharovich*, Z. Kryst., v., 96, 1880. The monoclinic character of phillipsite was first assumed by *Groth*, Tabell. Uebers. Min., pp. 62, 104, 1874.

Recent formation at Bourbonne-les-Bains, *Daubrée*, C. R., lxxx., 463, 1875; do. in Algiers, ib., lxxxiv., 157, 1877.

PHENICOCHROITE, Min., p. 630.—Made artificially, *Meunier*, C. R., lxxxvii., 656, 1878.

PHLOGOPITE, Min., p. 302.—See *Mica Group*, p. 77.

PHOLERITE, Min., p. 472; App. II., p. 44.—Anal., Distr. San Pablo, Peru, *Raimondi*, Min. Pérou, 302, 1878.

PHOSGENITE, Min., p. 703.—Cryst., Monte Ponì, Sardinia, showing a close agreement with the results of v. *Kokscharof*, from Gibbas, *Hansel*, Z. Kryst., ii., 291, 1878. See also Min. Russl., viii., 118, 143, 1881.

Recent formation at Bourbonne-les-Bains, *Daubrée*, C. R., lxxxii., 182, 1875. Made artificially, *Friedel* and *Sarasin*, Bull. Soc. Min., iv., 175, 1881.

PHOSPHOCHROMITE, App. I., p. 12.—Pisani (Bull. Soc. Min., iii., 196, 1880) has analyzed a phospho-chromate from Beresofsk, which is near the *phosphochromite* of Hermann (App. I., see laxmannite). It occurs in mammillary forms, having a crystalline surface. Color reddish orange; powder yellow. The analysis gave:

P_2O_5	CrO_3	PbO	CuO	
9.78	15.80	70.60	4.57	= 100.75.

The formula is $\text{Pb}_3\text{P}_2\text{O}_8 + (\text{Pb}, \text{Cu})\text{CrO}_4$.

Shepard has used the same name for a supposed substance, the existence of which even is not proved; see *Elroquite*, p. 41.

Phosphuranylite. *F. A. Genth*, Amer. Chem. J., i., 92, 1879.

Occurs as a pulverulent incrustation; shows with the microscope rectangular scales, with pearly lustre. Color deep lemon yellow. Analysis:

P_2O_5	UO_3	PbO	H_2O	
11.30	71.73	4.40	10.48	= 97.91.

The lead is regarded as being present as cerussite, which was visible under the microscope; deducting this the result becomes: P_2O_5 12.08, UO_3 76.71, H_2O 11.21 = 100. For this the formula is deduced: $(\text{UO}_2)_2\text{P}_2\text{O}_8 + 6\text{aq} = \text{P}_2\text{O}_5$ 12.75, UO_3 77.56, H_2O 9.69. B. B. in the closed tube yields water, and becomes brownish yellow on cooling. Easily soluble in nitric acid. Occurs with other uranium minerals at the Flat Rock mine, Mitchell Co., N. C.; incrusts the quartz, feldspar, and mica.

Phytocollite.—See *Dopplerite*, p. 38.

Picite. A. Nies, Ber. Oberhess. Ges. Nat. Heilk., xix., p. 112, 1880. A. Streng, J. Min., 1881, i., 116.

Amorphous; in thin coatings, or in small stalactitic and spherical forms. H. = 3-4. G. = 2.83. Color dark brown. Streak yellow. Lustre vitreous to greasy. Translucent. Fracture subconchoidal. Anisotropic. Analysis: Nies, after deducting 2.10 p. c. insoluble:

P ₂ O ₅	Fe ₂ O ₃	Al ₂ O ₃	H ₂ O	
24.47	46.50	1.00	28.03	= 100.

Formula: 4[Fe₂]P₂O₈ + 3[Fe₂]H₆O₆ + 27aq [but, as Nies remarks, it is by no means sure that the mineral is homogeneous]. From the Eleonore mine, near Bieben, and the Rothläufchen mine, near Waldgirmes, in the neighborhood of Giessen. Closely related, as shown by Nies, to the Picites resinaceus of Breithaupt (Handb. Min., i., 897), and to a phosphate mentioned by Boricky (Ber. Ak. Wien, lvi., 16, 1867) as occurring at the Hrbek mine, St. Benigna, Bohemia.

PICKERINGITE, Min., p. 653.—Anal., Colorado City, Col., Goldsmith, Proc. Acad. Nat. Sc. Phil., 1876, 333. Argentine Republic (Schickendantz), Brackebusch, Min. Argentin., 74, 1875.

A related mineral is called SONOMAITE by E. Goldsmith (Proc. Ac. Nat. Sc. Philad., 1876, 263). Crystalline. G. = 1.604. Silky lustre. Colorless. Analysis:

($\frac{1}{2}$)	SO ₃	Al ₂ O ₃	FeO	MgO	H ₂ O	
	38.54	8.01	1.78	7.33	[44.34]	= 100.

Formula: 3MgSO₄ + [Al₂]S₂O₁₂ + 33aq. From the neighborhood of the Geysers, Sonoma Co., California.

Picroallumogene of G. Roster (Boll. Com. Geol., 1876, 302) is another mineral very near pickeringite. Stalactitic; in nodular and fibrous radiated masses. Monoclinic or triclinic. Color white, with a rose-red tinge. Streak nearly white. Semi-translucent. Taste acid, bitter. Composition: 2MgSO₄ + [Al₂]S₂O₁₂ + 23aq = SO₃ 36.80, Al₂O₃ 9.48, MgO 7.36, H₂O 43.36 = 100. Analysis:

SO ₃	Al ₂ O ₃	MgO	H ₂ O	
36.38	9.16	8.19	45.69, K ₂ O 0.37, CoO tr.	= 99.79.

Fuses easily in its own water of crystallization, and swells out, becoming opaque and porous. Dissolves in slightly warmed water, forming an acid solution, from which oblique prisms resembling gypsum separate on slow evaporation. Occurs with sulphur and melanterite, in the iron mine of Vigneria, Island of Elba.

PICROMERITE.—Min., p. 642; App. II., p. 44.

PICROPHARMACOLITE.—Min., p. 555; App. II., p. 44.

PICROSMINE, Min., p. 405.—Anal. of a related mineral, Haslau, Plötzbachthal, Frenzel, Min. Petr. Mitth., iii., 512, 1881.

PICROTEPHROITE.—See *Tephroite*, p. 120.

PIEDMONTITE, Min., p. 285.—Crystallographic, optical, and chemical examination, Laspeyres, Z. Kryst., iv., 435, 1880.

Pilarite.—See *Chrysocolla*, p. 26.

Pilinite. A. von Lasaulx, J. Min., 1876, 358.

Orthorhombic (on optical grounds). In minute (.005 mm. to .01 mm.) prismatic crys-

tals, having a rhombic section of about 120° and 60° ; forming a fine felt-like mass, the needles often bent; resembles asbestos. Cleavage basal perfect, prismatic distinct. $G. = 2.263$. Lustre of needles silky. Color white to colorless. Needles pliable. Analysis. Bettendorff (l. c.):

SiO ₂	Al ₂ O ₃ , Fe ₂ O ₃	CaO	Li ₂ O	MgO, Na ₂ O, K ₂ O	H ₂ O
55.70	18.64	19.51	[1.18]	tr.	4.97 = 100.

The formula proposed is $(Ca, Li)_2 [Al_2] Si_5 O_{16} + aq$. Fuses easily with strong intumescence to a sponge-like bead. Insoluble in acids, even on boiling. Occurs with quartz, epidote, and stilbite in cavities in the granite of Striegau, Silesia. Named from *πίλιος*, *made of felt*.

Pilolite. *Heddle*, *Min. Mag.*, ii., 206, 1879.

Heddle has analyzed specimens of "mountain cork" (1, 2, 3, 4), and "mountain leather" (5, 6, 7), from several localities in Scotland, with the following results:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	CaO	MgO	H ₂ O* (total)	
1. Portsoy	51.43	7.52	2.06	2.49	1.30	0.58	9.35	25.04	= 99.76.
2. Cabrach	51.00	12.88	0.09	2.68	0.08	....	7.54	24.74	= 99.73.
3. Tod Head	51.61	6.63	....	2.70	2.77	1.11	10.21	25.00	= 100.63.
4. Tay Port	54.37	11.27	0.21	1.09	0.33	0.98	9.49	22.41	= 100.16.
5. Tod Head	52.43	6.33	0.60	2.11	2.88	1.34	11.95	21.70	= 99.39.
6. Lead Hills	51.45	7.98	0.97	3.29	1.49	1.97	10.15	21.70	= 98.99.
7. Boyne Burn	51.10	6.81	2.27	2.82	1.01	0.86	10.16	23.90	= 98.93.

* H₂O at 100°: in (1) 10.88, in (2) 10.64, in (3) 9.27, in (4) 9.26, in (5) 5.99, in (6) 5.96, in (7) 9.2.

The quantivalent ratio for the above is approximately, $R : [R_2] : Si : H = 4 : 3 : 20 : 15$, and the calculated formula $Mg_4 [Al_2] Si_{10} O_{27}, 15H_2O$.

The minerals have the characters ordinarily given under the names "mountain leather," and "mountain cork." Structure fibrous, more or less flexible and tough. Color white to pale buff, gray, etc. They occur in granular limestone, in granite veins, and in veins in sandstones and slates. Heddle states that the above mineral is not an alteration product of a variety of hornblende, but a distinct species. Named from *πίλιος*, *felt*. [Compare *xylotile*, p. 406.]

PINITE, *Min.*, p. 479; *App. II.*, p. 44.—*Anal.*, formed from andalusite, San Piero, Elba, *Grattarola*, *Boll. Com. Geol.*, 1876, 333. Södertörn, Sweden (rosite and polyargite), *Palmgren*, *Geol. För. Förh.*, i., 188, 1873.

From Eastern Massachusetts, analyses, occurrence, etc., *Crosby*, *Am. J. Sc.*, III., xix., 116, 1880.

See also *Iolite*, p. 63, *Killinite* (under Spodumene), p. 112.

PISANITE, *Min.*, p. 646.—*Massa Marittima*, Tuscany, optical exam., etc., SO_3 28.48, CuO 10.07, *C. Hintze*, *Z. Kryst.*, ii., 309, 1878.

PITTICITE.—*Min.*, p. 589; *App. II.*, p. 44.

Flagiocitrite. *Sandberger*; *Singer*, *Inaug. Diss.*, p. 13, Würzburg.

Monoclinic or triclinic. In microscopic crystals. $G. = 1.881$. Color lemon yellow. Translucent. Taste astringent. Analysis (after deducting 9.85 p. c. hygroscopic water):

SO ₃	Al ₂ O ₃	Fe ₂ O ₃	FeO	NiO	CoO	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O
35.44	14.37	7.95	1.64	0.97	0.58	1.19	0.43	4.04	4.23	29.42 = 100.26.

Formula $R_2SO_4 + [R_2]SO_6 + 9aq$. Easily soluble in water, the solution giving an acid reaction; by boiling, Fe_2O_3 separates out free from SO_3 . Decomposes on exposure, becoming orange yellow. B. B. swells up, fuses in its own water of crystallization, and leaves a reddish brown spongy residue. Occurs with other related sulphates at the Bauersberg near Bischofsheim vor der Rhön; derived from the decomposition of pyrite.

PLAGIONITE.—Min., p. 89; App. II., p. 44.

PLATINUM, Min., p. 10; App. II., p. 44.—Russia, *v. Kokscharof*, Min. Russl., vii., 143, 1875. *v. Jeremejef*, Verh. Min. Ges. St. Pet., II., xiv., 155, 1879. (Eisenplatin) from Nischne Tagilsk, *Terreil*, C. R., lxxxii., 1116, 1876; made artificially, *Daubrée*, C. R., lxxx., 526, 1875.

Ural, associated with chrysolite, serpentinite, chromite, *Daubrée*, C. R., lxxx., 707, 1875. Nugget found near Plattsburgh, N. Y., analysis by *Collier*, Am. J. Sc., III., xxi., 123, 1881. Weight 104.4 grams. G. = 17.35 of platinum; G. = 10.446 of mass consisting of 46 p. c. of platinum, and 54 p. c. of chromite.

PLUMBALLOPHANE.—App. I., p. 12.

PLUMBIODITE.—App. II., p. 44.

PLUMBOCUPRITE.—App. II., p. 44.

Plumbomanganite. *Hannay*, Min. Mag., i., 151, 1877.

Massive, crystalline. G. = 4.01. Color dark steel gray, with a bronze tinge when exposed to the air for some time. Analysis gave: Mn 49.00, Pb 30.68, S 20.73 = 100.41, for which the formula $3\text{Mn}_2\text{S} + \text{PbS}$ is suggested. [An imperfect description of a single specimen of doubtful homogeneity and uncertain source is not a satisfactory basis for a new name.]

Plumbostannite. *A. Raimondi*, Minéraux du Pérou, p. 187, 1878.

Amorphous; structure granular. H. = 2. G. = 4.5 (too low because of intermixed quartz). Lustre feebly metallic. Color gray. Feel greasy, like graphite. Slightly ductile. Intimately mixed with small crystals of quartz. Analysis (deducting 38.8 p. c. quartz):

S	Sb	Sn	Pb	Fe	Zn
25.14	16.98	16.30	30.66	10.18	0.74 = 100.

B. B. gives on charcoal antimonial fumes and a lead coating; yields metallic tin. Dissolves completely in HCl to which a little HNO_3 has been added. With concentrated nitric acid leaves a white residue of the oxides of tin and antimony and lead sulphate. From the district of Moho, province of Huancané, Peru; occurs with cassiterite and sphalerite. [Probably not homogeneous.]

POLLUCITE, Min., p. 249.—Cryst., Elba, *Corsi*, Z. Kryst., vi., 200, 1881.

Anal., Elba, *Rammelsberg* (Ber. Ak. Berlin, 1878, 9.; SiO_2 [48.15], Al_2O_3 16.31, Cs_2O 30.00, Na_2O 2.48, K_2O 0.47, H_2O 2.59, corresponding to $\text{H}_2\text{R}_2[\text{Al}_2]\text{Si}_6\text{O}_{15}$. G. = 2.868; another analysis is given in *ib.*, 1880, 669.

POLYARGYRITE.—App. I., p. 12.

POLYCRASE, Min., p. 523; App. II., p. 44.—Cryst., *Brögger*, Z. Kryst., iii., 484, 1879.

Anal., Småland, Sweden, *Blomstrand*, Minnesskrift Fys. Sällsk., Lund, 1878, p. 19 (Z. Kryst., iv., 524).

Polydymite. *H. Laspeyres*, J. pr. Chem., II., xiv., 397, 1876.

Isometric; in octahedrons, frequently in polysynthetic twins, often tabular. Cleavage basal imperfect. H = 4.5. G. = 4.808–4.816. Lustre brilliant metallic on fresh fracture. Color light gray, easily tarnished. Analyses, 1, 2, *Laspeyres*, on 0.28 and 0.2 gr.:

	S	Ni	Co	Fe	Sb	As
1.	40.27	53.51	0.61	3.84	0.51	1.04 = 99.78.
2.	39.20	53.13		4.12	1.15	2.30 = 99.90.

After deducting impurities (gersdorffite, ullmannite 5 p. c.), anal. 1 becomes S 41·09, Ni 54·30, Co 0·63, Fe 3·98 = 100, and from this the ratio is obtained, R : S = 4 : 5·096, corresponding to Ni_4Si_5 = S 40·55, Ni 59·45 = 100.

Insoluble in HCl, soluble in HNO_3 with separation of sulphur. B. B. decrepitates, in the closed tube gives a sulphur sublimate and fuses to a dark green magnetic bead. Occurs intimately mixed with gersdorffite, ullmannite, millerite, siderite, quartz, sphalerite, galenite, bismuthinite, and other minerals, at Grünau, in Sayn-Altenkirchen, Westphalia. [Closely related to beyrrichite (App. I., p. 3), if not identical with it.]

Laspeyres (ib., p. 403) expresses the opinion that the nickelwismuthglanz, or saynite of von Kobell (grünauite of Nicol, Min. p. 47), from the same locality, is a polydymite, impure through the admixture of bismuthinite, also chalcopyrite, and galenite. This, considering the distinct crystalline form of the mineral, seems, as urged by Kenngott (J. Min., 1878, 180), to be doubtful, although perhaps true of the massive mineral analyzed by von Kobell.

POLYHALITE, Min., p. 641; App. II., p. 44.—*Precht* (Ber. Chem. Ges., xiv., 2138, 1881) gives the following description of mineral called KRUGITE, a supposed new mineral near polyhalite, found at the salt works of New Stassfurt: Crystalline. H. = 3·5. G. = 2·801. According to a microscopic and optical examination, a homogeneous compound. Analyses:

	CaSO ₄	MgSO ₄	K ₂ SO ₄	H ₂ O	NaCl
1.	63·15	13·71	18·60	4·16	0·38 = 100.
2.	63·85	13·34	17·85	4·20	0·80 = 100·04.

Calculated formula: $K_2SO_4 + MgSO_4 + 4CaSO_4 + 2aq$, requiring: CaSO₄ 62·24, MgSO₄ 13·74, K₂SO₄ 19·90, H₂O 4·12 = 100. In cold water the magnesium sulphate is dissolved, and gypsum and the double salt $K_2SO_4 + CaSO_4 + 2aq$ are left insoluble; in hot water the magnesium and potassium sulphates are dissolved out, and only the gypsum is left behind. Named for the Mining Director, D. Krug, v. Nidda.

Posepnyte. *J. von Schröckinger*, Verh. G. Reichs., 1877, 128.

In plates and nodules, sometimes brittle, sometimes hard. Color generally dirty light green. G. = 0·85–0·95. Separated by ether into two parts; analyses by Dietrich, (1), of the portion soluble in ether; (2), the insoluble portion:

	C	H	O
1.	71·84	9·95	18·21 = 100.
2.	84·27	11·74	3·99 = 100.

The insoluble portion is regarded as being ozocerite, and for the rest the formula $C_2H_3O_4$ is calculated, requiring, C 72·52, H 9·89, O 17·59 = 100. From the Great Western mercury mine, Lake Co., California.

PREDAZZITE.—Min., p. 708; App. II., p. 45.

PREHNITE, Min., p. 410; App. II., p. 45.—*Cryst.*, Zöptau, v. *Rath*, Z. Kryst., v., 254 1880.

Pyro-electrical properties, *Hankel*, Wied. Ann., vi., 55, 1879.

Anal. (and cryst.), Tuscany, *Corsi*, Boll. Com. Geol., 1878, 54; 1879, 155. Monte Catini (prehnitoid), *Bechi*, Z. Kryst., iv., 399; Trans. Accad. Linc., III., iii., 114, 1879. Kuchelbad, near Prague, *Preis* and *Vrba*, Ber. Böhm. Ges., 1879, p. 468. Between Huan-cavelica and Ayacucho, Prov. d'Angaraes, Peru, anal. (by *Saldan*), *Raimondi*, Min. Pérou, 313, 1878. Templeton, Canada, *Harrington*, Geol. Canada, 1878.

Chlorastrolite (Min., p. 412) is shown by *Hawes* (Am. J. Sc., III., x., 25, 1875) to be essentially an impure prehnite. An analysis gave him: SiO₂ 37·41, Al₂O₃ 24·62, Fe₂O₃ 2·21, FeO 1·18, MgO 3·46, CaO 22·20, Na₂O 0·32 ($\frac{2}{3}$), H₂O 7·72 = 99·75. A microscopic examination proved the want of homogeneity.

Zonochlorite (Appendix II., p. 63) is probably also an impure prehnite; *Hawes* (Am. J. Sc., III., x., 24, 1875) obtained from an analysis of a dark green specimen: SiO₂ 35·94, Al₂O₃ 19·41, Fe₂O₃ 6·80, FeO 4·51, MgO 2·48, CaO 22·77, Na₂O tr., H₂O 8·40 = 100·34. Microscopic examination showed the presence of green earthy particles as impurities disseminated through a white mineral.

PRICEITE, App. II., p. 45.—A mineral, apparently identical with priceite, has been called PANDERMITE by *vom Rath*, Ber. nied. Ges. Bonn, July 2, 1877. Massive, finely crystalline, resembling marble. Color snow white. H. = 3. G. = 2.48. Calculated composition, $\text{Ca}_2\text{B}_2\text{O}_{11} + 3\text{aq} = \text{B}_2\text{O}_3$ 55.85, CaO 29.79, H_2O 14.36 = 100. Analyses, 1, *vom Rath*; 2, *Pisani*, Min., p. 215, Paris, 1875

	B_2O_3	CaO	FeO	MgO	K_2O	H_2O
1.	[54.59]	29.33	0.30	0.15	0.18	15.45 = 100.
2.	[50.1]	32.0	....	....	....	17.9 = 100.

Occurs in more or less irregular lumps or nodules of varying size up to a ton, in gray gypsum, at Panderma, on the Black Sea.

PROIDONINA—PROIDONITE. *A. Scacchi*, Att. Accad. Napoli, vi., 1873 (Contrib. Min., ii., 65).

Silicon fluoride (SiF_4), observed in the exhalations at Vesuvius at the time of the eruption in 1872.

PROUSTITE, Min., p. 96; App. II., p. 45.—Cryst., *Chañarcillo*, Chili, *Streng*, J. Min., 1878, 900.

PSEUDOAPATITE, Min., p. 531.—Pseudomorphous after pyromorphite, from the Churprinz mine, near Freiberg; analysis: P_2O_5 39.28, CaO 56.66, SO_3 1.42, CO_2 [2.64], Cl tr. = 100, *Frenzel*, Min. Petr. Mitth., iii., 364, 1880.

Pseudobrookite. *A. Koch*, Min. Petr. Mitth., i., 77, 344, 1878; *Gonnard*, Mem. Ac. Lyon, xxiv., 161, 1879-80; *Schmidt*, Z. Kryst., vi., 109, 1881.

Orthorhombic; in thin tabular (parallel $i-\bar{i}$) rectangular crystals, resembling some forms of brookite. Planes (Groth, Z. Kryst., iii., 306), $i-\bar{i}$, $i-\bar{i}$, I , $i-\bar{2}$, $1-\bar{1}$, $\frac{1}{2}i-\bar{i}$, $1-\bar{1}$, $1-\bar{3}$; $i-\bar{i} \wedge I = 135^\circ 54'$, $i-\bar{i} \wedge 1-\bar{1} = 138^\circ 41'$. Cleavage brachydiagonal, distinct; $i-\bar{i}$ vertically striated. H = 6. G. = 4.98. Lustre adamantine on crystalline faces, on fracture surfaces greasy. Color dark brown to black; the thinnest crystals red and translucent. Streak ochre yellow. Fracture uneven to subconchoidal.

Analysis (on 0.1 gr.): TiO_2 52.74, Fe_2O_3 42.29, ign. 0.69, Al_2O_3 , CaO, MgO, SiO_2 tr. = 95.72; the state of oxidation of the iron is in doubt. The author regards it as dimorphous with menaccanite. B. B. nearly infusible; reacts for iron and titanium with the fluxes. Decomposed in part by boiling HCl, wholly so by H_2SO_4 . Found with szaboite, in cavities in the andesite of the Aranyer Berg, Transylvania; also with szaboite and tridymite in the trachyte of Riveau Grand, Monte Dore.

Groth (l. c.) shows that the crystallographic determinations of Koch are faulty, and that the crystals may be referred to the axes of brookite by making $i-\bar{i}$ the basal plane, with which it may be identical, only differing in the large amount of iron. *Vom Rath*, however (Ber. nied. Ges. Bonn, March 3, 1879), thinks this improbable, on the ground that, with this change of position, the analogy with brookite in the vertical striation would no longer exist; he also urges that, as yet, no one of the three forms of TiO_2 has been found in volcanic rocks.

Pseudocotunnite. *A. Scacchi*, Att. Accad. Napoli, vi., 1873 (Contrib. Min., ii., 38).

Observed in acicular yellow opaque crystals, destitute of lustre, accompanying cotunnite, at Vesuvius, as a result of the eruption of 1872. Composition probably $\text{PbCl}_2 + \text{KCl}$.

PSEUDOMALACHITE, Min., p. 568; App. II., p. 45.—*Schrauf* (Z. Kryst., iv., i., 1879) uses *Bernhardi's* name, LUNNITE, for the group of minerals which have been included (see Min.) under PSEUDOMALACHITE, on the hardly sufficient ground that the latter name suggests only the indistinctly crystalline or massive forms, which resemble malachite. For the crystalline varieties, which are pseudo-monoclinic (triclinc), have G. = 4.4, and correspond mostly to $\text{Cu}_3\text{P}_2\text{H}_4\text{O}_{12}$, he uses the name *dihydrate* (D); they show no loss at 200° . The names *ehlite* (E) and *phosphorocalcite* (P) he gives to the compounds $\text{Cu}_3\text{P}_2\text{H}_6\text{O}_{13}$ and $\text{Cu}_4\text{P}_2\text{H}_8\text{O}_{14}$, respectively, and regards the three as entering in varying proportions to form the different massive varieties; the latter have a lower specific gravity, and lose water on ignition at 200° . Analyses: 1, "dihydrate," crystalline variety from Rheinbreitbach; 2, "ehlite," in

light grayish green hemispherical forms, from Ehl; 3, pseudomalachite, resembling malachite in structure, from Nischne-Tagilsk; 4, spherical form, with concentric structure, deep emerald green, from Libethen.

	P ₂ O ₅	CuO	H ₂ O
1. G. = 4·309	23·86	69·25	6·76, FeO 0·19 = 100·06.
2. G. = 4·102	22·07	66·97	7·59, FeO 0·30, SiO ₂ 3·01 = 99·94.
3. G. = 4·175	23·23	69·02	8·09 = 100·34.
4. G. = 4·156	22·16	69·11	8·02, FeO 0·22, SiO ₂ 0·11 = 99·62.

According to Schrauf's view, anal. 1 corresponds to a molecular mixture of 3D + 1P; 2, after deducting 8·8 p. c. chrysocolla (CuH₂SiO₄ + aq), to simply "dihydrate;" 3, to D + E + P; 4, to 4P + 2E + D; where the letters D, E, P have the values explained above. [A more extended chemical study of these minerals, with regard to the possible mechanical mixtures in the massive varieties with concentric structure, is needed to establish the value of this very artificial hypothesis.]

Pseudonatrolite. *Grattarola*, Att. Soc. Tosc., iv., 229, 1879 (Boll. Com. Geol., 1872, 284).

Orthorhombic (?). In minute, needle-like crystals, 0·5 mm. thick; crystals not terminated, six planes in the prismatic zone. Extinction parallel to the axis. H. = 5-6. Lustre vitreous to pearly. Colorless, white in the mass. Analysis:

SiO ₂	Al ₂ O ₃	CaO	MgO	Li ₂ O, Na ₂ O, K ₂ O	H ₂ O
(3) 62·64	14·76	8·54	tr.	1·00	14·82 = 101·76

B. B. fuses less readily than natrolite. Partially soluble in HCl. From the granite of San Piero, Elba. [Needs further examination.]

PSEUDOPHITE.—See *Penninite*, p. 90.

PSILOMELANE, Min., p. 180.—Salm Chateau, Belgium, analyses, discussion of composition, *Laspeyres*, J. pr. Ch., II., xiii., 1, 176, 1876. *Laspeyres* mentions especially the "lithium-psilomelane," or LITHIOPHORITE, as described by *Frenzel* (App. I., p. 9).

According to *Weisbach*, the kakochlor, from Rengersdorf, near Görlitz, belongs with lithiophorite. An analysis by *Iwaya* is quoted by him (J. Min., 1878, 846), and a second is quoted by *Frenzel*, J. Min., 1880, ii., 113 (see also J. Min., 1879, 55).

A variety of psilomelane, from Kalteborn, is called CALVONIGRITE by *Laspeyres*, J. pr. Ch., II., xiii., 226, 1876.

Psittacinite. *F. A. Genth*, Am. J. Sc., III., xii., 35, 1876. New tellurate of lead and copper, id., Proc. Am. Phil. Soc., xiv., 229, 1874 (Appendix II., p. 55).

In thin crypto-crystalline coatings, sometimes small mammillary or botryoidal; also pulverulent. Color siskin-green to olive-green, sometimes with grayish tint. Analyses, *Genth* (l. c.), on material more or less impure through admixture of quartz and limonite:

	V ₂ O ₅	PbO	CuO	H ₂ O	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	CaO
1.	15·87	42·89	14·72	undet.	10·10	3·83	2·19	0·65	0·15.
2.	14·64	41·36	14·34	7·42	15·13	1·20	2·72	undet.	
3.	15·77	42·38	15·03	7·25	15·57	4·00.			
4.	9·96	27·12	9·75	undet.	48·84.				
5.	19·05	50·17	16·66	undet.	7·60.				

The mean quantivalent ratio deduced from the above for Pb:Cu:V:H = 1:0·98:2·25:2·15 = 9:9:20:18, corresponding to the formula 3Pb₃V₂O₈ + Cu₃V₂O₈ + 6CuH₂O₂ + 12aq, which requires: V₂O₅ 19·32, PbO 53·15, CuO 18·95, H₂O 8·58 = 100. Related to

chileite, Min., p. 612. B. B. fuses easily to a black, shining mass. Reacts for lead, copper, and vanadium with the fluxes. Soluble in dilute nitric acid.

Occurs associated with gold, cerussite, chalcopyrite, and limonite, on quartz, at the Iron Rod mine, and New Career mine, in the Silver Star District, Montana. Named from *psittacinus*, siskin or parrot green.

PUCHERITE, App. I., p. 12; II., p. 45.—Made artificially, *Frenzel*, J. Min., 1875, 680.

Occurrence at the "Arme Hilfe" mine, at Ullersreuth, near Hirschberg, Vogtland, and at the mine "Sosaer Glück," at Sosa, near Eibenstock, *Weisbach*, J. Min., 1880, ii., 113.

PYRARGYRITE, Min., p. 94; App. II., p. 45.—**Cryst.**, *Andreasberg, vom Rath*, Pogg. Ann., clviii., 422, 1876. *Chañarcillo*, (Chili, *Streng*, J. Min., 1878, 913; also anal. (p. 916) showing 3·8 p. c. As. *Andreasberg, Freiberg, etc.*, *Groth*, Min.-Samml. Strassburg, p. 62, 1878.

PYRICHROLITE.—App. II., p. 45.

PYRITE, Min., p. 62; App. II., p. 45.—**Cryst.**, *Waldenstein, Carinthia, Helmhacker*, Min. Mitth., 1876, 13. *V. Kokscharof*, Min. Russl., viii., 190, 1878. *Groth*, Min.-Samml. Strassburg, p. 31, 1878. *Ordubad, Russian Armenia, Websky*, ZS. G. Ges., xxxi., 222, 1879. *Przibram, Vrba*, Z. Kryst., iv., 357, 1880. *Böckstein, Salzburg, v. Zepharovich*, Lotos, 1875 (Z. Kryst., v., 270, 1880). Crystallo-genetic observations, *Scharff*, Abh. Senck. Ges., 1878.

Recent formation at Bourbonne-les-Bains, *Daubrée*, C. R., lxxx., 605, 1875.

Analyses, *Girard and Morin*, Ann. Ch. Phys., V., vii., 229, 1876.

PYRITOLAMPRITE.—App. II., p. 46.

PYROAURITE, Min., p. 179.—Described by *Heddle* (Min. Mag., ii., 107, 1878), from the island of Haaf-Grunay, Scotland. Occurs in thin seams in serpentine. Structure obscurely fibrous. Color silvery white. Lustre pearly. Analyses :

	Fe ₂ O ₃	MgO	H ₂ O	CO ₂	
1.	22·13	37·80	39·27	1·02	= 100·22.
2.	22·45	37·57	39·51	1·03	= 100·56.
3.	23·63	36·55	40·02	....	= 100·50.

B. B. infusible, becomes chocolate brown, and strongly magnetic. Soluble in acids. *Heddle* proposes to call this mineral ISELSTRÖMITE (after the discoverer), instead of pyroaurite, on the ground that the golden color is not essential.

PYROCHLORE, Min., p. 512; App. II., p. 46.—See *Hatchettolite*, p. 56.

PYROCHROITE, Min., p. 177.—*Mossgrufva, Wermland, Sjögren*, Geol. Förr. Förh., ii., 531, 1875; iii., 181, 1876; iv., 159, 1878. *Nordenskiöld* (anal. by *Stahre*), iv., 163, 1878. Occurs with manganosite (q. v.).

Pyroconite.—See *Pachnolite*, p. 88.

Pyroldesine. *C. U. Shepard*, Cat. Meteorites, 1872.—A substance near serpentine. The mean of two analyses gave : SiO₂ 42·45, MgO 33·07, FeO 6·85, H₂O 16·40. De Regla, Cuba.

PYROLUSITE, Min., p. 165; App. II., p. 46.—Formed artificially, *Hannay*, Min. Mag., ii., 90, 1878.

Groth shows (Min.-Samml. Strassburg, p. 112, 1878), on the basis of measurements by *Hirsch*, that $I \wedge I = 99^\circ 30'$.

Composition of the "Braunstein" group discussed, *Laspéyres*, J. pr. Ch., II., xiii., 176, 215, 1876.

From Gosalpur, Jabalpur distr., India, anal. *F. R. Mallet*, Rec. Geol. Surv. India, xii., 99, 1879.

PYROMORPHITE, Min., p. 535; App. II., p. 45.—**Cryst.**, Mine Friedrichsregen, in Nassau, *Seligmann*, Verh. Nat. Ver. Bonn, xxxiii., 257, 1876.

Baumhauer shows by the results of etching with solvents, that the crystals are pyramidal hemihedral, *J. Min.*, 1876, 411.

On the relation of uniaxial pyromorphite to biaxial mimetite, *Bertrand*, Bull. Soc. Min., iv., 36; *Jannettaz*, ib., p. 39, 1881; *Jannettaz* and *Michel*, ib., p. 196 (see *Mimetite*, p. 81).

Anal., Dernbach, Nassau, *Hilger*, *J. Min.*, 1879, 132.

Pyrophosphorite. *C. U. Shepard, Jr.*, Am. J. Sc., III., xv., 49, 1878.

Massive, earthy. H. = 3-5. G. = 2.50-2.53. Color snow-white, dull; also in part bluish gray, with small botryoidal structure. Analyses: Shepard (l. c.), 1, mean of two analyses; 2, same, after deducting impurities.

	P ₂ O ₅	MgO	CaO	Fe ₂ O ₃ , Al ₂ O ₃	SO ₃	SiO ₂	ign.	
1. (½)	50.80	3.09	44.46	0.44	0.63	0.36	0.39	= 100.17.
2.	51.67	3.17	45.16	=				100.

From 2, above, the following formula is calculated: Mg₂P₂O₇ + 4(Ca₃P₂O₈ + Ca₂P₂O₇), which requires: P₂O₅ 51.57, CaO 45.20, MgO 3.23 = 100. Named in allusion to its apparent composition as a pyrophosphate. From the West Indies; exact locality unknown. [Was the material analyzed homogeneous? Needs further examination.]

PYROPHYLLITE, Min., p. 454; App. II., p. 46.—**Analyses**, *Helmhacker*, Min. Petr. Mitth., ii., 256, 1879. *Dewalque*, Bull. Soc. Geol. Belg., vi., 150, 151, 1879. As petrifying material, *Genth*, Am. Phil. Soc. Philad., xviii., 259, 1879. A related mineral from Delsbo, Helsingland, *Jolin*, Geol. För. Förh., i., 237, 1873.

PYROSMAILITE, Min., p. 414; App. II., p. 46.—Nordmark, anal. and discussion of composition, *Ludwig*, Min. Mitth., 1875, 211. Occurrence at the Kogrufva (formerly Bjelkesgrufva), Nordmark, *Sjögren*, Geol. För. Förh., ii., 409, 1875. Dannemora, Sweden, anal., *Engström*, Geol. För. Förh., iii., 116, 1876.

PYROSTILPNITE, Min., p. 93.—Probable occurrence at Schemnitz, Hungary, *Becke*, Min. Petr. Mitth., ii., 94, 1879.

A mineral from Chañarillo, Chili, is described by *Streng* as pyrostilpnite (*J. Min.*, 1878, 917); but *Schrauf* shows that it has the same form as rittingerite, as determined by him (*J. Min.*, 1879, 144), and the true character of it is still in doubt, *Streng*, *J. Min.*, 1879, 547.

PYROXENE, Min., p. 212; App. II., p. 46.—**Cryst.** (augite), Bell, near Laach, *Laspeyres*, Z. Kryst., i., 203, 1877. Nordmark, *Sjögren*, Geol. För. Förh., iv., 364, 1879. Achmatowsk, Ural, lamellar twin growth, *von Rath*, Z. Kryst., v., 495, 1881. Nordmark, *Lehmann*, Z. Kryst., v., 532, 1881. *Von Kokscharof*, Min. Russl., viii., 234, 1881.

Thermo-electrical characters, *Hankel*, Wied. Ann., i., 279, 1877.

Augite and biotite crystals, in parallel position, do. hornblende, Vesuvius, *von Rath*, *J. Min.*, 1876, 389. Analyses of augite and hornblende associated together, *Hawes*, Am. J. Sc., III., xvi., 397 (Report Min. Lith. New Hampshire, p. 63).

Anal. (diopside), Nordmarksberg, *Nauckhoff*, Geol. För. Förh., i., 167, 1873. Långban (richterite), *Engström*, Geol. För. Förh., ii., 469, 1875. Finland (malacolite), (Efv. Finsk. Vet. Soc., xvii., 70, 71, 1874-5. Santorin, *Fouqué*, C. R., lxxx., Mar., 1875. Altered to uralite, *Harrington*, Geol. Canada, 1878. Kaiserstuhl (3.55 p. c. TiO₂), *Knop*, Z. Kryst., i., 64, 1877. Wallenfels, near Dillenburg (chromdiopside), *Oebbeke*, Z. Kryst., ii., 104. Dun Mt., New Zealand, *Hilger*, *J. Min.*, 1879, 129. Amherst Co., Va., *Page*, Ch. News, xlii., 194, 1880. Wiesenthal, Baden (diallage), *Petersen*, *J. Min.*, 1831, i., 264.

Analyses of Scottish varieties, with discussion of the products of alteration, *Hedde*, Trans. Roy. Soc. Ed., xxviii., 453, 1878.

Discussion of composition, with analyses. *Dölter*, Min. Mitth., 1877, 65; Min. Petr. Mitth., i., 49, 1878; ii., 193, 1879; iii., 450, 1880.

Artificially made (augite), *vom Rath*, Ber. nied. Ges. Bonn, July 2, 1877; do., diopside, *Gruner*, C. R., lxxxvii., 937, 1878.

PYRRHITE, Min., p. 763; App. II., p. 46.—See *Microlite*, p. 80.

PYRRHOTITE, Min., p. 58; App. II., p. 46.—**Cryst.**, twin, Elizabethtown, Ontario (anal. by *Harrington*), *E. S. Dana*, Am. J. Sc., xi., 386, 1876. Bottino, Italy, *Grattarola*, Boll. Com. Geol., 1876; *D'Achiardi*, Att. Soc. Tosc., ii., 114, 1876. Auerbach, *Roth*, Ber. Oberhess. Ges. Nat. Heilk., 1878, 45. Chañarcillo, Chili, *Streng*, J. Min., 1878, 925. Streng urges that pyrrhotite is isomorphous with sternbergite, and should be regarded as orthorhombic, with pseudo-hexagonal symmetry due to twinning (see *Sternbergite*, p. 115).

Anal., Todtmoos (1·8 p. c. Ni), *Mutschler*, Ann. Ch. Pharm., clxxxv., 208. American specimens, containing Ni, *How*, Min. Mag., i., 124, 1877. Polson's Lake, N. S. (0·77 Ni), *Harrington*, Can. Nat., II., ix., 307, 1880.

Analyses with discussion of composition, *Lindström*, Cefv. Ak. Stockh., xxxii., No. 2, 25, 1875; *Habermehl*, Ber. Oberhess. Ges. Nat. Heilk., xviii., 83, 1879.

QUARTZ, Min., p. 189; App. II., p. 46.—**Cryst.**, La Gardette, Dauphiné, twin (P2) *Gonnard*, Verh. nied. Ges. Bonn, xxxi., 139, 1874. Japan, twin with inclined axes, *vom Rath*, Pogg. Ann., clv., 57, 1875. Twin (i-2), *Groth*, Pogg. Ann., clviii., 220, 1876. Oberstein, v. *Lasaulx*, J. Min., 1876, 264. On calcite crystals in parallel position, pseudo-twins i-2, *E. S. Dana*, Am. J. Sc., xii., 448, 1876 (see also J. Min., 1876, 171, 405, 730). With basal plane, *Lehman*, Ber. Nat. Ges. Leipzig, March 12, 1875; *Maskelyne*, Z. Kryst., i., 67. Brazilian amethysts, *Groth*, Z. Kryst., i., 297, 1877. Pyrogenic quartz in lava, *Lehmann*, Verh. Nat. Ver. Bonn, xxxiv., 23, 1877. Krennitz, *vom Rath*, Ber. nied. Ges. Bonn, Dec. 3, 1877 (Z. Kryst., ii., 99, 1878). *Groth*, Min.-Samml. Strassburg, p. 92, 1878. Striegau, Silesia, *Websky*, Zs. G. Ges., xxx., 374, 1878. Bohemia, *Krejci*, Ber. Ges. Böhm., 1879, 30. Reichenstein, Silesia, *Hare*, Z. Kryst., iv., 298. Zöptau, Moravia, *vom Rath*, Z. Kryst., v., 1, 1880. Dissentis, *vom Rath*, Ber. nied. Ges. Bonn, Nov. 8, 1880. Remarkable crystals from Alexander Co., N. C., *Hidden*, Am. J. Sc., III., xxii., 23, 1881. *Von Kokscharof*, Min. Russl., viii., 127, 1881.

Crystallo-genetic observations, *Scharff*, Abhandl. Senck. Nat. Ges., 1874; J. Min., 1876, 168. Containing liquid carbon dioxide (CO₂), *Hartley*, J. Ch. Soc., II., xiv., 137, 237. Containing CO₂ and NaCl from pegmatite, in Norway, *Helland*, Arch. Math. Nat. Christ., ii., 445, 1877. Middlefield, N. Y., inclusions, *Hirschwald*, J. Min., 1879, 378; *Lewis*, Pr. Ac. Nat. Sc. Phil., 1880, 292. Inclosing much CO₂, Branchville, Conn., and other localities (smoky quartz), *Hawes*, Am. J. Sc., III., xxi., 203, 1881. Analysis of gases in Branchville smoky quartz (CO₂, N, H₂S, SO₂, H₂N, F), *A. W. Wright*, Am. J. Sc., III., xxi., 209, 1881.

Rotatory effect for heat rays of spectrum, *Desains*, C. R., lxxxiv., 1056; same for ultra-violet, *Soret* and *Sarasin*, ib., lxxxiv., 1362. Accurate determination of indices of refraction for different rays, *Sarasin*, C. R., lxxxv., 1230, 1878. Circular polarization for different temperatures, *Joubert*, C. R., lxxxvii., 497, 1878; *Sohncke*, Wied. Ann., iii., 516, 1878; *von Lang*, Pogg. Ann., clvi., 422, 1875. Pyro-electric characters, *Hankel*, Wied. Ann., x., 618. Specific gravity determinations, *Church*, Geol. Mag., II., ii., 321, 1875.

Made artificially, *Hautefeuille*, C. R., lxxxvi., 1133, 1194, 1878; xc., 830, 1880 (Bull. Soc. Min., i., 1, 1878); also *Friedel* and *Sarasin*, Bull. Soc. Min., ii., 113, 1879.

A variety of quartz, having a "peculiar metallic pearly lustre," and forming a coating on ordinary quartz crystals, has been called COTTERITE by *Harkness* (Min. Mag., ii., 82, 1878), from Rockforest, Ireland.

An impure variety of silica, occurring in white earthy masses, is called PASSYITE by *E. Marchand*, Ann. Ch., Phys., V., i., 292, 1874.

RABDIONITE.—App. I., p. 13.

Rabdophane.—See *Rabdophane*, p. 103.

RAIMONDITE, Min., p. 656.—Optical characters, *Des Cloizeaux*, Bull. Soc. Min., iv., 41, 1881.

RALSTONITE, App. I., p. 13; II., p. 47.—Analogous to garnet in optical character, biax-

ial, with an angle of 90° (see p. 50), *Bertrand*, Bull. Soc. Min., iv., 34, 1881. According to *Brandl*, quoted by *Groth* (Tabell. Uebers. Min., p. 42, 126, 1882), the true formula is $3(\text{Na}_2, \text{Mg}, \text{Ca})\text{F}_6 + 8[\text{Al}_2]\text{F}_6 + 6\text{H}_2\text{O}$.

RAMMELSBURGITE, Min., p. 77; App. II., p. 47.—*Anal.*, Portezuelo del Carrizo, Dept. of Huasco, Chili, *Domeyko*, Min. Chili, 3d ed., p. 186, 1879.

Randite. A canary-yellow incrustation on granite, at Frankford, near Philadelphia, Penn., is described by *König* (Proc. Ac. Nat. Sc. Philad., 1878, 408) as a hydrous carbonate of calcium and uranium. He gives an analysis, made on a very small amount (0.047 gr.) of impure material: $[\text{CO}_2 \ 29.34]$, $\text{U}_2\text{O}_3 \ 31.63$, $\text{CaO} \ 32.50$, $\text{H}_2\text{O} \ 6.53 = 100$. *T. D. Rand* (ib., 1880, 274) shows that the coating consists largely of calcite, and after this has been removed by acetic acid, there remain the unattacked tufts of acicular crystals of randite; these, dissolved in hydrochloric acid, yielded largely of calcium and uranium, with a trace of phosphoric acid, alumina, etc. He justly adds, that further investigation is needed to establish the composition of the mineral.

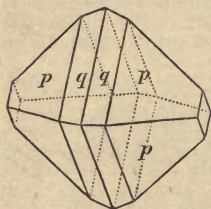
RAUTE.—App. II., p. 47.

REALGAR, Min., p. 26.—*Cryst.*, Binnenthal, *Groth*, Min.-Samml. Strassburg, p. 20, 1878. *Fletcher*, Phil. Mag., V., ix., 189, 1880.

Occurrence in trachyte, of Tolfa, Rome, Italy, *Sella*, Accad. Linc. Trans., III., i., 66, 1877. In Iron Co., Utah, *W. P. Blake*, Am. J. Sc., III., xxi., 219, 1881.

Reddingite. *G. J. Brush* and *E. S. Dana*, Am. J. Sc., III., xvi., 120, 1878; *ibid.*, xvii., 365, 1879.

• Orthorhombic, habit octahedral. Axes, c (vert.), b : $a = 1.0930 : 1.1524 : 1$. Observed planes (see figure): $1(p)$, $1-\bar{2}(q)$, $i-\bar{i}(b)$. $I \wedge I = 98^\circ 6'$, $p \wedge p = 114^\circ 44'$ and $= 103^\circ 10'$ (terminal) $= 110^\circ 43'$ (basal); $q \wedge q = 144^\circ 30'$. Also granular, massive. Cleavage distinct in one direction. $H. = 3-3.5$. $G. = 3.102$. Lustre vitreous to sub-resinous. Color pale rose-pink to yellowish-white, sometimes dark reddish-brown on surface from alteration. Translucent to transparent. Fracture uneven. Brittle. Formula: $\text{Mn}_2\text{P}_2\text{O}_8 + 3\text{aq}$. Percentage composition: $\text{P}_2\text{O}_5 \ 34.72$, $\text{MnO} \ 52.08$, $\text{H}_2\text{O} \ 13.20 = 100$. Analyses: 1, *H. L. Wells*, after deducting 12.08 p. c. quartz; 2, after deducting 4.42 p. c. quartz.



	P_2O_5	FeO	MnO	CaO	Na_2O	H_2O	
1. ($\frac{2}{3}$)	34.52	5.43	46.29	0.78	0.31 (Li ₂ O tr.)	13.08	= 100.41.
2.	35.16	7.89	43.22	0.71	....	12.27	= 99.25.

In the closed tube, first whitens, then turns yellow, and finally brown, but does not become magnetic. Fuses in the naked lamp-flame. B. B. colors the flame pale green, and fuses easily to a blackish-brown non-magnetic globule. Reacts for manganese and iron with the fluxes. Soluble in acids. Occurs sparingly at Branchville, Fairfield Co., Conn., intimately associated with fillowite, fairfieldite, dickinsonite, in a vein of albitic granite. Black octahedral crystals, pseudomorphs after reddingite, are also found. Named from Redding, the name of the town in which the locality is situated.

In crystalline form, reddingite is closely related to scorodite and strengite, but differs from them in composition, containing but three equivalents of water, and having the metals in the protoxide state.

REDONTE.—App. I., p. 13.

Reichardtite.—See *Epsomite*, p. 42.

Reinite. *K. v. Fritsch*, Z. gesamt. Nat. III., iii., 864, 1878; *Lüdecke*, J. Min., 1879, 286.

Tetragonal: c (vert.) $= 1.279$ (approx.). In octahedral crystals, with $1-i$ as narrow truncation; $1 \wedge 1 = 122^\circ 8'$ (basal) $= 103^\circ 32'$ (pyr.). Cleavage, I , indistinct. $H. = 4$.

G. = 6.649. Lustre dull, submetallic. Color blackish brown. Streak brown. Opaque. except in the thinnest splinters. Fracture uneven. Analysis, E. Schmidt :

WO ₃	FeO	
75.47	24.33	CaO, MgO tr. = 99.80.

Formula : FeWO₄ = WO₃ 76.31, FeO 23.68 = 100. Same composition as wolframite, but differs in form ; probably isomorphous with scheelite and wulfenite. B. B. fuses to a dark brown slaggy bead, which is not magnetic. With salt of phosphorus in O. F., brownish red, in R. F., with metallic tin, grayish green. In aqua regia dissolves, with the separation of yellow tungsten trioxide. Occurs with large quartz crystals, from Kimbosan, in Kei, Japan. Named for Prof. Rein, of Marburg, who brought the mineral from Japan. [A pseudomorph?]

REISSITE, App. I., p. 14.—See *Epistilbite*, p. 42.

RESANITE.—App. II., p. 48.

RESIN.—Anal., Greenland, *Chydenius*, Geol. Förh. Förh., ii., 549, 1875. Oberschlesien, v. *Lasaulx*, Z. Kryst., v., 345, 1881. For various fossil resins, see list on p. xiii,

RESTORMELITE.—App. I., p. 13.

RETINITE. Pitchstone (Des Cloizeaux, Min., p. 346), from Russia, anal., *Pisani*, Bull. Soc. Min., ii., 42, 1879.

RHABDITE. A mineral (anal. by Carnot : Fe 84.28, P 12.10, As 1.65, S 1.75, C tr. = 99.78) formed by combustion in the coal mines of Commentry, France, is referred by *Mallard* (Bull. Soc. Min., iv., 230, 1881) to the meteoric mineral called rhabdite by Rose.

Rhabdophane. *Lettsom*, Z. Kryst., iii., 191, 1878 ; *L. de Boisbaudran*, C. R., lxxxvi., 1028, 1878.

Named from two specimens in the Oxford University collection, which have for fifty years gone by the name of blende, from Cornwall : exact source unknown. By a spectroscopic examination *Lettsom* has found it to give the absorption bands of didymium and erbium, and concludes that it is a phosphate of those bases. *Boisbaudran* remarks that monazite gives the same results with the spectroscope, so that rhabdophane might be a variety of that species. *Bertrand* finds that the mineral is uniaxial and positive (Bull. Soc. Min., iii., 53, 1830) ; an analysis gave : P₂O₅ 27.70, Ce₂O₃(Di₂O₃, La₂O₃) 67.20. In optical character, it is shown, consequently, to agree not with monazite, but with cryptolite and phosphocerite (Min., p. 529), with which it has the same composition.

RHAGITE.—App. II., p. 48.

RHODITE.—App. II., p. 48.

RHODOCHROSITE, Min., p. 691 ; App. II., p. 48.—Cryst., Daaden, Rheinprovinz, *Weiss*, ZS. G. Ges., xxxi., 801, 1879. Eleonore mine (Louise mine, according to Seligmann), Hohenhausen, *Sansoni*, Z. Kryst., v., 250, 1880.

Pseudomorph after alabandite and barite, *Döhl*, Verh. G. Reichs., 1875, 95.

Anal., Moët-Fontaine, Ardennes, *de Koninck*, Bull. Ac. Belg., II., xlvii., 568, 1879.

A variety of rhodochrosite has been called MANGANOSIDERITE by *Bayer* (Verh. Nat. Ver. Brünn, xii., May 10, 1873). In appearance it resembles sphärosiderite. An approximate analysis gave : MnCO₃ 54.0, FeCO₃ 38.8, CaCO₃ 6.84, MgCO₃ tr., corresponding nearly to 2MnCO₃ + FeCO₃. From Dobschau, Felsöbanya, Nagybanya, Kapnik, in Hungary.

Deposits of a ferrous manganous carbonate, at Moët Fontaine (Rahier), Belgium, are described by *Firket*, Mem. Soc. Geol. Belg., v., 33, 1878 ; Bull. Soc. Geol. Belg., vi., 152, 1879. *Penfield* has analyzed a variety from Branchville, Conn., with 16.76 FeO, Am. J. Sc., III., xviii., 50, 1879. For other intermediate varieties, see *Siderite*, p. 109.

RHODONITE, Min., p. 225.—**Cryst.**, Pajsberg, Sweden (pajsbergite), *Sjögren*, Geol. För. Förh., v., 259, 1881.

Occurrence in the Ural, *Lebedef*, Verh. Min. Ges. St. Pet., II., xiii., 1, 1878.

Anal. (18 p. c. CaO = bustamite), Långban, *Lindström*, Gfv. Ak. Förh. Stockh., xxxv., 6, p. 57, 1880.

A variety of rhodonite from Franklin Furnace, N. J., is called **KEATINGINE** by Shepard (*Contrib. Min.*, 1876), it contains 5.6 p. c. ZnO (= fowlerite).

RIONITE.—App. I., p. 14.

RIPIDOLITE, Min., p. 497; App. II., p. 48.—See *Penninite*, p. 90.

RITTINGERITE, Min., p. 94; App. II., p. 48.—Occurs at Schemnitz, Hungary, *Becke*, Min. Petr. Mitth., ii., 94, 1879.

See also *Pyrostilpnite*, p. 90.

RIVOTITE.—App. II., p. 48.

Rogersite. *J. L. Smith*, Am. J. Sc., III., xiii., 367, 1877.

Massive. As a thin mammillary crust on samarskite. H. = 3.5. G. = 3.313. Color white. Analyses (stated to be only approximate): 1, Cb_2O_5 18.10, Y_2O_3 , etc. 60.12, H_2O 17.41 = 95.63; 2, Cb_2O_5 20.21, H_2O 16.34, Y_2O_3 undet. Considered as a decomposition product of samarskite, with which, and with hatchettolite, it occurs in Mitchell Co., N. C. Named after Prof. Wm. B. Rogers. [Needs further examination.]

ROEMERITE, Min., p. 655.—**Cryst.**, *Lüdecke*, Z. gesamt. Nat., III., v., 407, 889, 1880.

ROEPERITE.—App. II., p. 49.

ROMEITE, Min., p. 547.—According to *Bertrand*, the octahedral crystals are formed by the grouping of 8 rhombohedral crystals of 90° about the central point, Bull. Soc. Min., iv., 240, 1881.

Roscoelite. *J. Blake*, Am. J. Sc., III., xii., 31, 1876; *Genth*, ib., p. 32. *H. E. Roscoe*, Proc. Roy. Soc., xxv., 109, 1876. *Genth*, Am. Phil. Soc. Philad., xvii., 119, 1877, or Z. Kryst., ii., 8, 1877.

Micaceous in structure; basal cleavage perfect. Scales minute, often arranged in stellate or fan-shaped groups. Biaxial, acute bisectrix negative, normal to cleavage, $\rho < \nu$ (*Des Cloizeaux*, Bull. Soc. Min., i., 51, 1878; iv., 56, 1881).

Soft. G. = 2.902 (Roscoe); 2.921, 2.938, purest (*Genth*). Lustre pearly, inclining to submetallic. Color dark clove brown to greenish brown, dark brownish green. Analyses: 1, *Genth* (after deducting 0.85 gold, quartz, etc.); 2, 3, Roscoe.

	SiO ₂	V ₂ O ₅	Al ₂ O ₃	Fe ₂ O ₃	Mn ₂ O ₃	FeO	MgO	CaO	Na ₂ O	K ₂ O	Li ₂ O	H ₂ O	
1.	47.69	20.56	14.10	.....	.....	1.67	2.00	.....	0.19	7.59	tr.	4.96 = 98.76.
2.	41.25	28.85	V ₂ O ₅	14.34	1.04	1.45	1.96	0.61	0.72	8.25	0.94	hygrosc.
												[water 2.12 = 101.53.]	
3.	28.36	V ₂ O ₅	13.94	1.23	0.85	2.06	0.62	0.92	8.87	1.22	hygrosc.
												[water 2.42.]	

In his first paper, *Genth* gives five other analyses, made on material more or less impure. He also announces the vanadium as present as V_6O_{11} (= $2\text{V}_2\text{O}_5 + \text{V}_2\text{O}_3$), but in the later publication regards it possible that it is all V_2O_3 ; he shows that the mineral is always more or less impure through mechanical admixture, and on this ground questions the correctness of Roscoe's results. *Genth* deduces the formula $\text{K}(\text{Mg}, \text{Fe})[\text{Al}_2, \text{V}_2]_2\text{Si}_{12}\text{O}_{32} + 4\text{aq}$, which requires: SiO_2 49.33, Al_2O_3 14.09, V_2O_5 20.62, FeO 1.64, MgO 1.83, K_2O 7.55, H_2O 4.94 = 100. Roscoe, on the other hand, makes the mineral a vanado-silicate, thus: $4\text{AlVO}_4 + \text{K}_2\text{Si}_2\text{O}_7 + \text{aq}$, which requires: SiO_2 41.18, V_2O_5 27.63, Al_2O_3 15.59, K_2O 14.24, H_2O 1.36 = 100. B. B. fuses easily to a black glass. Gives with salt of phosphorus a dark yellow bead O. F., and an emerald green bead R. F. Only slightly acted upon by acids.

Occurs intimately mixed with gold in seams ($\frac{1}{10}$ to $\frac{1}{20}$ in. thick) in porphyry, and filling cavities in quartz, at the gold mine at Granite Creek, near Coloma, El Dorado Co., California; also from Big Red Ravine, near Sutter's mill, where gold was first discovered in California (*Hanks*, Min. Sc. Press, June 25, 1881). *Hanks* remarks, that at the Granite Creek locality, some 400 or 500 lbs. of the mineral have been discovered, which were wasted in the extraction of the gold.

Genth also describes (l. c.) a mineral occurring in the Magnolia District, Colorado, as a thin earthy incrustation, of a grayish to olive green color on calaverite, also inclosed in quartz, and giving it a green color. An analysis of the quartz gave: Quartz 79.38, Te 1.05, Au 0.03 = 80.46; the balance (19.5 p. c.) is assumed to belong to the green mineral which forms the coloring matter. An analysis of this, after the deduction of the quartz, gave (mean of 5 partial analyses): SiO₂ 56.74, Al₂O₃ 19.62, V₂O₅ 7.78, FeO 3.84, MgO 2.63, Na₂O 0.94, K₂O 8.11, MnO, Li₂O tr., H₂O undet. = 99.66. *Genth* regards this as probably closely related to rooseelite, perhaps a variety.

ROSELITE, Min., p. 560; App. II., p. 49.—Analyses by *Winkler*, J. pr. Ch. II., xvi., 86, 1877 (quoted by *Weisbach*, Jahrb. Berg.-Hüttenwesen, 1877).

	As ₂ O ₃	CoO	CaO	MgO	H ₂ O	
1.	52.93	10.56	24.93	3.95	8.35	= 100.72.
2.	52.41	10.03	25.17	4.22	8.22	= 100.05.

These correspond to the formula: R₃As₂O₈ + 2aq (not 3aq, *Schrauf*); if Ca:Co:Mg = 10:3:2, then the formula gives: As₂O₃ 52.39, CoO 10.25, CaO 25.51, MgO 3.65, H₂O 8.20 = 100.

Rosterite.—See *Beryl*, p. 13.

ROSTHORNITE.—App. II., p. 49.

Rubislite. *Heddle*, Trans. Soc. Edinb., xxix., 112, 1879.

A dark green compact granular or fine foliated aggregate. G. = 2.44. Analysis: SiO₂ 37.85, Al₂O₃ 10.92, Fe₂O₃ 9.84, FeO 9.01, MnO 0.46, CaO 4.22, MgO 8.00, K₂O 3.33, H₂O 16.13 = 99.76. Completely decomposed by hydrochloric acid. B. B. fuses to a brown slag. From the granite of Rubislaw, near Aberdeen, Scotland. [To be classed with the already too large list of doubtful substances of the so-called "chlorite group."]

RUTILE, Min., p. 159; App. II., p. 49.—**Cryst.**—paramorphs after arkansite (brookite), Magnet Cove, *vom Rath*, J. Min., 1876, 397; pseudomorphs after hematite, Binnenthal, *id.*, Z. Kryst., i., 13, 1877, and eightlings from Magnet Cove, Ark., *ibid.*, p. 15. (Ilmenorutile), Wschiwoi-See, Ilmen Mts., *v. Jeremejef*, Verh. Min. Ges. St. Pet., II., xii., 284; xiii., 419; xiv., 239. Associated with magnetite in parallel position, Binnenthal, *Seligmann*, Z. Kryst., i., 340, 1877. In splendid crystals, from Alexander Co., North Carolina, *Hidden*, Am. J. Sc., III., xxi., 159, 1881.

Mullard includes rutile among the pseudo-tetragonal minerals (Ann. Min., VII., x., 134, 1876); see also *Brookite*, p. 18.

As a microscopic constituent of rocks, *Sauer*, J. Min., 1879, 569 (see zircon); 1880, i., 94; 1881, i., 227.

Janovsky (Ber. Ak. Wien, lxxx., 34, 1880) has given the name **ISERIT** to what he regards as a new titanate. It was found among the black grains of the so-called "iserin" of the Iserwiese, Bohemia. It is distinguished from the true iserin by the absence of conchoidal fracture and the brown color. In thin fragments it is honey yellow. Crystalline form like rutile, occasionally in twins; cleavage imperfect. G. = 4.52. Analysis: TiO₂ 70.01 ($\frac{2}{3}$), FeO 28.68 ($\frac{2}{3}$), MnO 1.41, MgO 0.32, Cb₂O₅, SiO₂ 0.44 = 99.73, corresponding to the formula: FeTi₂O₈. [*Groth* (Z. Kryst., v., 400) justly remarks that the mineral is not far from the ferruginous rutile called nigrine, and that a more exact determination as to form, homogeneity, etc., is needed to prove its independent character. If it is an independent species the name is an unfortunate one, as tending to confusion with the distinct iserin, also called iserite.]

SAHLITE.—See *Pyroxene*, p. 100.

SAL AMMONIAC.—App. II., p. 49.

SAMARSKITE, Min., p. 520; App. II., p. 49.—Cryst. description, Mitchell Co., N. Carolina, *E. S. Dana*, Am. J. Sc., III., xi., 201, 1876.

Analyses, Mitchell Co., N. C.: 1, *Miss E. H. Swallow*, Proc. Nat. Hist. Bost., xvii., 424, 1875. 2, *O. D. Allen*, Dana's Text-Book Min., 1877, p. 340, and Am. J. Sc., III., xiv., 130, 1877. 3, *J. L. Smith*, Am. J. Sc., III., xiii., 362, 1877. 4, *Rammelsberg*, ZS. G. Ges., xxix., 817, 1877.

	Ta ₂ O ₅	Ca ₂ O ₅	SnO ₂ , WO ₃	UO ₃	Ce ₂ O ₃ (Di ₂ La ₂ O ₃)	Y ₂ O ₃	FeO	MnO	CaO	H ₂ O
1.	54.96		0.16	9.91 UO	5.17 CeO	12.84 YO	14.02	0.91	0.52 MgO	0.66,
						[insol. residue from cerium oxalate	1.25 = 100.40.			
2.	($\frac{2}{3}$) 18.20	37.50	0.08	12.54	4.17	14.48	10.75	0.78	0.55	1.12
									(= 109.17.	
3.	.....	55.13	0.31	10.96	4.24	14.49	11.74	1.53	MgO tr.	0.72
										(= 99.12.
4. G. = 5.836	14.36	41.07	0.16	10.90	2.37	6.10	14.61	Fe ₂ O ₃ , Er ₂ O ₃	10.80, TiO ₂	[0.56 (SiO ₂) = 100.93.

Anal. of Miask samarskite, *Rammelsberg*, ZS. G. Ges., xxix., 817, 1877.

Examination of the earths contained in samarskite from North Carolina: *J. L. Smith* ("mosandrum"); C. R., lxxxvii., 146, 148, 831, 1878. *Delafontaine* (terbium), Bibl. Univ., II., lxi., 273, 1878; *id.* (decipium, phillipium), *ib.*, III., iii., 246, 250, 1880; C. R., xciii., 63, 1881. Same subject discussed by *Marignac*, Bibl. Univ., III., iii., 413, 1880.

Damour (Bull. Ac. St. Pet., xxiii., 463, 1877) shows that the VIETINGHOFITE of *v. Lomonosof* is essentially a ferruginous variety of samarskite. Amorphous. H. = 5.5-6. G. = 5.53. Color black, dull. Streak brown. Lustre submetallic. Easily decomposed by H₂SO₄. An analysis gave: Cb₂O₅ 51.00, TiO₂ 1.84, ZrO₂ 0.96, U₂O₃ 8.85, Y₂O₃ 6.57, Ce₂(Di, La)₂O₃ 1.57, FeO 23.00, MnO 2.67, MgO 0.83, ign. 1.80 = 99.09. Locality near Lake Baikal, in the Ural.

SAPONITE, Min., p. 472; App. II., p. 49.—Analyses, from igneous rocks in Scotland, *Hedde*, Trans. Soc. Edinb., xxix., 91 et seq., 1879. See also *Bowlingite*, p. 17.

SARAWAKITE. *Frenzel*, Min. Mitth., 1877, 300. Occurs in minute crystals, with many planes and rounded angles, "probably tetragonal." Soft. Lustre adamantine. Colorless or wine yellow to greenish yellow. Transparent. Contains antimony, anhydrous. Found in cavities in the native antimony of Borneo. [Needs further examination. Senarmonite?]

SARCOPSIDE.—App. I., p. 14.

SAUSSURITE.—Anal., Midsäterfjeld, Bergen, Norway, *Hjortdahl*, Nyt. Mag. Nat., xxiii., 1877. Analyses quoted, and discussion of the relations between the different varieties, *J. D. Dana*, Am. J. Sc., III., xvi., 340, 395, 1878.

SAYNITE.—See *Polydymite*, p. 95.

SCAPOLITE, Min., p. 317; App. II., p. 50.—Analyses, Rossie, N. Y., *Sipőcz*, Min. Mitth., 1877, 266. Boxborough, Mass., *Becke*, 1877, 267. Various Canadian localities, *F. D. Adams*, Am. J. Sc., III., xvii., 315, 1879. Bamle, Norway, *Michel-Lévy*, Bull. Soc. Min., i., 43, 1878. Monzoni, *Kiepenheuer*, Ber. nied. Ges. Bonn, Aug. 4, 1879. Malsjö, Arendal, and Gouverneur, *Sipőcz*, Min. Petr. Mitth., iv., 265, 1881.

Adams calls attention to the fact that unaltered scapolite uniformly contains chlorine (up to 2.48 p. c.). The presence of this element is also shown by Neminar in meionite, and by *Sipőcz* and *Becke* (l. c.).

See also *Meionite*, p. 74.

A scapolite from Galway, Ontario Co., Canada, has been called ONTARIOLITE by *C. U. Shepard* (Am. J. Sc., III., xx., 54, 1880). It occurs in prismatic crystals in a limestone; the color is black or gray, from the presence of admixed impurities. The pure portions

are transparent and colorless, $H = 7-7.5$. [The value of an approximate analysis given is destroyed by the impurity of the material analyzed; thus far it has no claim to be considered an independent species.]

SHEELITE, Min., p. 605; App. II., p. 50.—**Cryst.**, Untersulzbachthal, etc., *Groth*, Min.-Samml. Strassburg, p. 157, 1878.

Absorption bands in spectrum (Ce, La, Di), *Cossa*, *Accad. Line. Mem.*, III., iii., 24, 31, 1878.

Occurrence with gold, Charity mine, Warren's, Idaho, and Golden Queen mine, Lake Co., Col., *Silliman*, *Am. J. Sc.*, III., xiii., 451, 1877. From the Victoria Reef mine, Adelong, New South Wales, *Liversidge*, *Proc. Roy. Soc. N. S. W.*, Nov. 3, 1880.

SCACCHITE.—App. II., p. 50.

SCHIRMERITE.—App. II., p. 50.

Schneebergite. *A. Brezina*, *Verh. Geol. Reichs.*, 1880, 313.

Isometric; in small (0.5–1 mm.) octahedrons. Cleavage dodecahedral in traces. $H = 6.5$. $G = 4.1$ (Weidel). Lustre vitreous to adamantine. Color honey yellow. Transparent. Fracture conchoidal. Brittle. Consists principally (Weidel) of lime and antimony, with a little iron, and traces of copper, bismuth, zinc, magnesia, and sulphuric acid. B. B. infusible, becomes slightly brown. Insoluble in acids. Found by Lhotsky, at Schneeberg, Tyrol, near the union of anhydrite (or gypsum) with chalcopyrite and magnetite. [Needs further examination. Perhaps related to atopite, p. 10.]

SCHORLOMITE, Min., p. 390.—According to *Knop*, does not occur at Oberschaffhausen, in the Kaiserstuhl (*Z. Kryst.*, i., 58, 1877); but the mineral which has received that name is either a titaniferous melanite or pyroxene.

Intimately associated with melanite, Magnet Cove, Ark., *König*, *Proc. Acad. N. S. Phil.*, 1876, 36.

Schraufite. *J. von Schröckinger*, *Verh. Geol. Reichs.*, 1875, 134.

A mineral resin occurring in small masses and in layers, in the schistose sandstone (Carpathian sandstone), near Wamma, in Bukowina. $H = 2-3$. $G = 1.0-1.12$. Color hyacinth to blood red. Translucent. Fracture semi-conchoidal to splintery. Melting point 326° , when decomposition goes on. Partially soluble in alcohol, benzol, and chloroform; completely soluble in sulphuric acid, the larger portion of the resin separating as a grayish-yellow slimy mass, upon dilution with water. Analysis by Dietrich:

C	H	O
73.81	8.82	17.37.

Formula: $C_{11}H_{10}O_2$, requiring: C 73.33, H 8.89, O 17.78 = 100. With this resin correspond also a resin from Mizun and Höflein, and less closely others from the neighborhood of Lemberg. *Schröckinger* proposes to include the several occurrences under the name *Schraufite*, after Prof. A. Schrauf, of Vienna. The same resin occurs in the Libanon, according to *John* (*Verh. G. Reichs.*, 1876, 255); see also *Bronner*, *Württ. Nat. Jahresh.*, xxxiv., 81, 1878.

SCHREIBERSITE.—Min., p. 61; App. II., p. 50.

SCHRÖCKERINGERITE.—App. II., p. 50.

SCHWARTZEMBERGITE, Min., p. 120.—Optically uniaxial, negative, *Bertrand*, *Bull. Soc. Min.*, iv., 87, 1881.

SCOLECITE, Min., p. 423; App. II., p. 50.—**Cryst.**, *Lüdecke* (*J. Min.*, 1880, ii., 200; 1881, ii., 1) distinguishes between the monoclinic (Iceland and Kandallah) and triclinic (from the

Schattigé Wichel, Fellinen Alp, Faröe, and Etlzithal) varieties, and makes them isomorphous with similar varieties of mesolite.

Pyro-electrical characters, *Hankel*, Wied. Ann., vi., 56, 1879.

Anal. (Bechi), Casarzia, Liguria, *Issel*, Boll. Com. Geol., 1879, 530. Etlzithal, *Schmid*, Ber. Jenaisch. Ges. Med. Nat., July 9. 1880. Schattigé Wichel, Fellinen Alp, *Lüdecke*, J. Min., 1881, ii., 19.

SCORODITE, Min., p. 574.—**Cryst.**, Beresofsk, Ural, v. *Kokscharof*, Min. Russl., vi., 307, 1874. Dernbach, Nassau, v. *Lasaulx*, J. Min., 1875, 629; vom *Rath*, J. Min., 1876, 394.

Anal., Distr. Lucma, Peru, *Raimondi*, Min. Pérou, p. 228, 1878.

Made artificially, *Bourgeois* and *Verneuil*, Bull. Soc. Min., iii., 32, 1880.

See also *Strengite* and *Reddingite*.

An earthy mineral, formed from the decomposition of arsenopyrite, and referred to scorodite, has been called JOGYNNAITE by *N. v. Nordenskiöld*. Occurs with beryl at Aduntshilon, Nertschinsk. See v. *Kokscharof*, Bull. Acad. St. Pet., xix., 571, 1873.

SCOLOPSITE.—See *Ittnerite*, p. 63.

SEEBACHITE, App. II., p. 50.—See *Herschelite*, p. 57.

SELLAITE, App. I., p. 14.—The corresponding compound, MgF_2 , made artificially, *Cossa*, Accad. Linc. Mem., III., i., 33, 1876, or Z. Kryst., i., 207, 1877.

Corrections of angles and symbols previously given, *Strüver*, Att. Accad. Torino, xii., 59, 1876.

SELWYNITE, Min., p. 509; App. I., p. 19.—According to a microscopic examination by *Ulrich*, a mixture, consisting of a felsite-like base, with hydrous chromic oxide and occasional octahedrons of chromite, Am. J. Sc., III., xi., 235, 1876.

Semseyite. *Krenner*, Ungar. Revue, 1881, 367. Briefly announced as containing sulphur, antimony, and lead, and related to pligionite, from Wolfsberg, in the Harz. Occurs in gray crystals, with diaphorite, sphalerite, and pyrite, at Felsőbanya.

SENARMONTITE, Min., p. 184.—According to *Mallard* (Ann. Min., VII., x., 108, 1876), pseudo-isometric, the crystals being made up of 48 triclinic individuals. The same subject has been investigated by *A. Grosse-Bohle* (Z. Kryst., v., 222, 1880); he concludes that the species is to be regarded as monoclinic, and the crystals made up of 12 individuals (including those parallel, 24), twinned parallel to *O* and *1*; he however suggests, in conclusion, that the optical anomalies may have another explanation, and the mineral still be included in the isometric system. An examination of artificial crystals of arsenolite led to similar results.

SEPIOLITE, Min., p. 456.—A fibrous variety from Utah, analyzed by *Chester*, Am. J. Sc., III., xiii., 296, 1877.

SERICITE, Min., p. 487.—A massive muscovite, as shown by *Laspeyres* (Z. Kryst., iv., 244), who explains the varying results of earlier investigators by the greater or less impurity of the substance examined. He regards it as having owed its origin to the alteration of feldspar. On the sericite from the Taunus, see *Wichmann*, Verh. Nat. Ver. Bonn, xxxiv., 1, 1877.

SERPENTINE, Min., p. 464; App. II., p. 51.—Description and analyses: Pusunsaari, *Ungern*, *Schildt*, Cfv. Finsk. Vet. Soc., xvii., 70, 1874-75. Zöblitz, Greifendorf, Waldheim, *Lemberg*, ZS. G. Ges., xxvii., 531, 1875. New Jersey, *Berwerth*, Min. Mitth., 1875, 110. Vosges, *Weigand*, Min. Mitth., 1875, 183. Northern Norway, *Pettersen*, J. Min., 1876, 613. Nordmark, *Lundström*, Geol. För. Förh., iii., 191, 1876. Långban, Wermland (7-8 p. c. MnO), *Pajkull*, Geol. För. Förh., iii., 351, 1877. Verrayes, Val d'Aosta, *Cossa*, Accad. Linc. Mem., III., ii., 933, 1878. Reichenstein, Silesia, *Hare*, Inaug. Diss. Breslau,

1879 (Z. Kryst., iv., 294). Florida, Mass. (picrolite), anal. by Melville, *Wadsworth*, Bost. Soc. Nat. Hist., xx., 286, 1879.

Microscopic examination, metaxoite, picrofluite, *Wiik*, Öfv. Finsk. Vet. Soc., xvii., 8, 1874-75.

A serpentine mineral is called **TOTAIGITE** by *Hedde* (Trans. Soc. Edinburgh, xxviii., 455, 497, 1878). It appears as a pseudomorphous substance surrounding malacolite, in a granular limestone; resembles danburite, from Danbury, Ct. Lustre weak, glimmering. Color pale fawn, sometimes blue-black. Cleavage distinct. Fracture conchoidal. Soft. Often surrounded itself by yellow green or dark gray serpentine. Analyses: 1, fawn-colored variety; 2, dark blue variety, on the surface ochre yellow; G. = 2.84-2.893.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	H ₂ O	
1.	37.22	0.76	....	1.05	0.23	44.97	5.24	....	....	10.64	= 100.11.
2.	36.19	0.26	0.29	2.96	0.45	45.57	3.27	0.42	0.25	10.20	= 99.87.

Locality Totaig, Ross-shire, Scotland. The author justly does not regard this as in any sense a mineral species [but why should it receive a name?]. Its method of occurrence suggests that it is an intermediate product between the pyroxene and the final serpentine; but the author calls attention to the fact that it contains more magnesia than the last-named species.

Serpierite. *Des Cloizeaux*, Bull. Soc. Min., iv., 89, 1881; *Bertrand*, ib.

Orthorhombic; in minute tabular (*O*) crystals elongated, often grouped in light tufts, and striated in the direction of the shorter diagonal. Observed planes: *O*, *I*, 1, also 1- λ , $\frac{3}{4}$ - λ , probable, and $\frac{3}{4}$ - λ , $\frac{1}{2}$ - λ , $\frac{1}{3}$ - λ , 8- λ , all doubtful. $I \wedge I = 98^\circ 42'$, $O \wedge 1 = 115^\circ 32'$. Optic-axial plane macrodiagonal, bisectrix negative. $2H = 43^\circ 35' - 44^\circ 20'$, and $2E = 65^\circ 57' - 67^\circ 10'$, red; dispersion $\rho > \nu$. Color greenish bluish. Transparent. In composition, according to *Damour*, a basic sulphate of copper and zinc. [Needs further examination on the chemical side.] From Laurium, Greece.

Siderazot. *O. Silvestri*, Pogg. Ann., clvii., 165, 1876.

A product of volcanic eruption, observed at Mt. Etna after the eruption of Aug., 1874, as a very thin coating on lava. Non-crystalline. Lustre metallic, resembling steel. Slowly attacked by acids. An analysis gave: Fe 90.86, N 9.14 = 100, which corresponds to Fe₃N₂, or that adopted by *Frémy* for the artificial iron nitride.

SIDERITE, Min., p. 688; App. II., p. 51.—Anal., San Giovanni, Val d'Arno, Italy, *Grattarola*, Boll. Com. Geol., 1876, 342. Felsöbanya, anal. by *Dietrich* (27.7-44.4 p. c. MnCO₂), *Kapnik* (3.98 MnCO₂), v. *Schröckinger*, Verh. geol. Reichs., 1877, 114. Newburyport, Mass., *Miss E. H. Swallow*, Proc. Bost. Soc. Nat. Hist., xvii., 464, 1875. Earthy variety (amorphous), easily soluble in cold acids, from the Schwelm mine, *Muck*, Z. Berg.-Hütt.-Sal.-Wesen, xxviii., 189, 1880.

Recent formation at Bourbonne-l'Archambault, *Daubrée*, C. R., lxxx., 1300, 1875.

See also *Rhodochrosite*, p. 103, for other intermediate compounds.

Sideronatrite. *Raimondi*, Minéraux du Pérou, p. 212, 233, 1878. *Domeyko*, 3d ed. Min. Chili, p. 158, 1879.

In crystalline masses. H. = 2.5. G. = 2.153. Color dark yellow. Streak pale yellow to yellowish white. Analysis:

SO ₂	Fe ₂ O ₃	Na ₂ O	H ₂ O	
43.26	21.60	15.59	15.35	earthy matter 3.20, NaCl mechanically mixed 1.06 = 100.06.

Formula Na₂SO₄ + [Fe₂]S₂O₉ + 6aq. Insoluble in water, but decomposed on heating, with the separation of iron sesquioxide. Soluble in acids. From the mine San Simon, Huantajaya, province of Tarapaca, Peru.

Another sulphate, almost identical with sideronatrite, has been called **URUSITE** by *A. Frenzel* (Min. Petr. Mitth., ii., 133, 359, 1879). Orthorhombic. Pulverulent, earthy; also in lumps, but consisting of minute prismatic crystals with pinacoids, and also *I*, 1, 1- λ and *O*. Soft. G. = 2.22. Color lemon to orange yellow. Streak ochre yellow. Transparent in

minute crystals. Calculated formula: $\text{Na}_4[\text{Fe}_2]\text{S}_4\text{O}_{17} + 8\text{aq} = \text{SO}_3 \cdot 42\cdot78, \text{Fe}_2\text{O}_3 \cdot 21\cdot39, \text{Na}_2\text{O} \cdot 16\cdot58, \text{H}_2\text{O} \cdot 19\cdot25 = 100$. Analyses, 1, 2; 1, after deducting 3 p. c. insoluble:

	SO_3	Fe_2O_3	Na_2O	H_2O	
1.	42·08	21·28	16·50	16·80	= 99·66.
2.	41·64	22·00	17·24	[19·12]	= 100·00.

Insoluble in water, easily soluble in HCl. Decomposed in boiling water, with separation of Fe_2O_3 . Found underlying deposits of iron vitriol (melanterite) on the Urus plateau, near Sarakaja, on the naphtha island, Tscheleken, in the Caspian Sea. [Both of the above sulphates are near the uncertain bartholomite of Cleve, App. II., p. 6.]

Siderophyllite.—See under *Mica Group*, p. 80.

SIEGBURGITE, App. II., p. 51.—Full description by *v. Lasaulx*, J. Min., 1875, 128.

Silaonite.—See *Guanajuatite*, p. 53.

Silberwismuthglanz.—See *Alaskaite*, p. 3.

SILVER, Min., p. 9; App. II., p. 51.—Cryst., twins, *vom Rath*, Z. Kryst., iii., 12, 1878. Silver ores from Orenburg, *v. Beck*, J. Min., 1876, 162.

S. B. Wight describes a supposed alloy of silver and copper (Ag 53 to 75 p. c.) of a light brass color, and G. = 9·943, 9·330; from the Detroit and Lake Superior Copper Co., Eng. Min. J., xxx., 153, 1880.

SIMLAITE.—App. II., p. 51 (44).

SIMONYITE.—App I., p. 14; II., p. 51 (8).

Sipylite. *J. W. Mallet*, Am. J. Sc., III., xiv., 397, 1877; xxii., 52, 1881.

Tetragonal; in octahedrons. $1 \wedge 1$ (pyr.) $100^\circ 45' = 127^\circ$ (basal). Cleavage 1, distinct. Usually imperfectly crystalline, or in irregular masses. H. = 6 nearly. G. = 4·89. Lustre resinous and pseudo-metallic. Color brownish black to brownish orange; in splinters red brown. Streak light cinnamon brown to pale gray. Translucent. Fracture uneven, and small conchoidal. Brittle. Analysis by W. G. Brown:

Cb_2O_5	WO_3	SnO_2	ZrO_2	Eb_2O_3	Ce_2O_3	La_2O_3	Di_2O_3	UO	FeO	BeO	MgO	CaO	Na_2O	K_2O	H_2O
48·66*	0·16	0·08	2·09	27·94†	1·37	3·92‡	4·06§	3·47	2·04	0·62	0·05	2·61	0·16	0·06	3·19
													[MnO tr., Li_2O tr., F tr. = 100·43.		

* With Ta_2O_5 about 2 p. c.

† With Y_2O_3 about 1 p. c.

‡ Di_2O_3 , tr. § Ce_2O_3 , tr.

Taking together the acid oxides of columbium (niobium), tantalum, tungsten, tin, and zirconium as M_2O_5 , and reducing all the basic elements to the form RO, and neglecting the water, the ratio RO : $\text{M}_2\text{O}_5 = 221 : 100$ is obtained, which corresponds to the formula: $\text{R}_3\text{M}_2\text{O}_8 + 4\text{R}_2\text{M}_2\text{O}$. Mallet prefers to include the water, making the hydrogen basic, and deduces on this supposition the formula: $\text{R}_3\text{M}_2\text{O}_8$. This view, as he shows, is supported by the fact that in form sipylite is very near fergusonite.

B. B. decrepitates, and glows brilliantly, becomes pale greenish yellow and opaque; infusible. In the closed tube gives off acid water. With borax in O. F. gives a yellow bead, pale on cooling; in R. F. assumes a greener tint. Boiled in strong HCl partially dissolves, the solution reacting for zirconium with turmeric paper; when metallic tin is added and the solution diluted, a sapphire blue color is obtained (columbium). Decomposed completely, though slowly, in boiling concentrated sulphuric acid. Occurs sparingly, imbedded in, or more commonly adherent to, masses of allanite and magnetite, at the north-west slope of Little Friar Mountain, Amherst Co., Virginia. Named from *Sipylus*, one of the children of Niobe, in allusion to the names niobium and tantalum.

DeLaFontaine (C. R., lxxxvii., 933, 1878) states that sipylite contains yttrium, erbium (in small quantities), philippium (see samarskite), and also the ytterbium of Marignac (see gadolinite).

SKUTTERUDITE, Min., p. 71; App. II., p. 51.—*Anal.*, Ramsay, J. Ch. Soc., 1876, 153.

SMALTITE, Min., p. 70; App. II., p. 51.—*Bauer* (ZS. G. Ges., xxvii., 245, 1875) questions the conclusion of Groth as to the hemihedral character of the species, while the latter gives further descriptions (Min.-Samml. Strassburg, 43, 1878) of hemihedral forms.

Found in Zapotlan, Jalisco, Mexico, *Navia*, *Naturaleza*, iv., 41, 1877.

Discussion of composition, *Rammelsberg*, *Pogg. Ann.*, clx., 131, 1877.

SMITHSONITE, Min., p. 692; App. II., p. 52.—Zinc ore deposits at Wiesloch, Baden, *Schmidt*, Heidelberg, 1881.

SNARUMITE.—See *Anthophyllite*, p. 7.

SODA NITRE (Caliche), Min., p. 592.—In South America, occurrence, exploitation, etc., *V. L'Olivier*, *Ann. Ch. Phys.*, V., vii., 289, 1876. *Anal.*, Tarapaca, Peru, *Raimondi*, *Min. Pérou*, p. 289 et seq., 1878. *Machattie*, *Chem. News*, xxxi., 263, 1875.

SODALITE, Min., p. 330; App. II., p. 52.—*Cryst.*, Is. Laaven, Langesundfiord, Norway, *Klien*, *J. Min.*, 1879, 534.

From Ditró, Transylvania, *Koch*, *Min. Mitth.*, 1877, 332; *J. Min.*, *Beil.-Bd.*, i., 149, 1880. From Tiahuanaco, Bolivia, optical examination, *Feussner*, *Z. Kryst.*, v., 581, 1881; analysis, *Bamberger*, *ib.*, p. 583.

SOMMARUGAITE.—See *Gersdorffite*, p. 51.

SONOMAITE.—See *Pickeringite*, p. 93.

SPATHIOPYRITE.—App. II., p. 52.

SPHALERITE, Min., p. 48.—*Cryst.*, *Groth*, *Min.-Samml. Strassburg*, p. 23, 1878. *Sadebeck*, *ZS. G. Ges.*, xxx., 573, 1878. *Hautefeuille*, *C. R.*, xciii., 774, 1881.

Effect on indices of refraction of change of temperature, and of curving of surfaces of prism, *Calderon*, *Z. Kryst.*, iv., 504, 1880; *Voigt*, *ibid.*, v., 113, 1880.

"Faserige blende," in part wurtzite, *v. Lasaulx*, *J. Min.*, 1876, 629. *Christophite*, *St. Agnes*, Cornwall, *Collins*, *Min. Mag.*, iii., 91, 1879.

American blendes containing indium, *Cornwall*, *Am. Chem.*, vii., 389, 1877; Norwegian do., *Wleugel*, *Nyt. Mag. Nat. Christ.*, xxiv., 333, 1879. Gallium in sphalerite, from the Pierrefitte mine, Vallée Argelès, Pyrénées, *L. de Boisbaudran*, *C. R.*, lxxxii., 493, 1875.

SPHÆROCObaltite. *Weisbach*, *Jahrb. Berg.-Hütt.*, 1877. In small spherical masses. Crystalline in structure, both concentric and radiated. Externally velvet black; within rose red. Streak peach-blossom red. H. = 4. G. = 4.02-4.13. Formula: $\text{CoCO}_3 = \text{CO}_2$ 36.94, CoO 63.06. Analysis, *Winkler*:

CO ₂	CoO	Fe ₂ O ₃	CaO	H ₂ O	
34.65	58.86	3.41	1.80	1.22	= 99.94.

Iron hydrate is present in small quantity, as an impurity. B. B. in closed tube becomes black. Attacked slowly by cold acids; rapidly with effervescence when warmed. Occurs with roselite at Schneeberg, Saxony.

SPHENE.—See *Titanite*, p. 122.

SPIAUTERITE.—See *Wurtzite*, p. 132.

SPINEL, Min., p. 147; App. II., p. 52.—*Cryst.*, Albani Mts., Italy, *Sella*, *Z. Kryst.*, i., 233, 1877. Polysynthetic twins, *Strüver*, *Accad. Line. Trans.*, III., ii., 109, 1878. *Taschkent*, *v. Jeremejef*, *Verh. Min. Ges. St. Pet.*, II., xiii., 426; *Z. Kryst.*, iv., 642.

Determinations of specific gravity, *Church*, Geol. Mag., II., ii., 322, 1875.
 Made artificially, *Meunier*, C. R., xc., 701, 1880. Anal., Monte di Tiriolo, near Catan-
 zaro, *Mauvo*, Acad. Linc. Trans., III., iii., 65, 1879.
 See also *Gahnite*.

Spodiosite. *H. V. Tiberger*, Geol. För. Förh., i., 84, 1872.

Orthorhombic. In prismatic crystals, flattened parallel the brachypinacoid, with the
 planes, $i\text{-}i$, I , 1, 2- i . $I \wedge i\text{-}i = 132^\circ$, $I \wedge I = 96^\circ$, $2\text{-}i \wedge 2\text{-}i = 33^\circ$ top. $H = 5$. $G =$
 2.84. Lustre dull porcelain-like, but vitreous. Color ash gray, inclining to brown. Streak
 white. Fracture uneven. Brittle.

Analysis by C. H. Lundström :

P ₂ O ₅	CaO	F	As ₂ O ₅	CO ₂	Cl	Fe ₂ O ₃	Al ₂ O ₃	MnO	MgO	H ₂ O	insol.	
32.20	49.81	[4.71]*	0.24	3.90	0.12	1.24	1.11	0.55	2.27	2.70	1.15	= 100.

* Including loss [but the analysis should show an excess].

Disregarding the calcium carbonate, the mineral consists essentially of calcium phos-
 phate and calcium fluoride, in the ratio of 5 : 4 or $5Ca_3P_2O_8 + 4CaF_2$; but the analysis
 hardly gives a definite decision as to the true composition.

B. B. fuses in the thinnest splinters to a white enamel; does not decrepitate. Soluble in
 HCl and HNO₃, with effervescence. From the Krangruva, Wermland, Sweden. Named
 from $\sigma\pi\delta\iota\omicron\varsigma$, *ash gray*. [Perhaps a pseudomorph of apatite, after some other mineral.]

SPODUMENE, Min., p. 228.—Analyses: 1, *Pisani*, C. R., lxxxiv., 1509, 1877; 2, 3, *Döller*,
 Min. Petr. Mitth., i., 524, 526, 1878; 4, 5, *Julien*, Ann. N. Y. Acad. Sc., i., 322, 1879;
 6, *Penfield*, Am. J. Sc., III., xx., 259, 1880; 7, *J. L. Smith*, Am. J. Sc., III., xxi., 128,
 1881; 8, *Genth*, priv. contrib. The spodumene from Pennikojä, in Somero, Finland, has
 been analyzed by *Cajander*, Öfv. Ak. Finsk., xvii., 70, 1874-5.

	SiO ₂	Al ₂ O ₃	FeO	MnO	CaO	MgO	Li ₂ O	K ₂ O	Na ₂ O	Ign.		
1. Brazil, G. = 3.16	63.80	27.93	1.05	0.12	0.48	...	6.75	...	0.89	...	= 101.00.	
2. Norwich	63.79	27.63	0.39	...	0.73	0.21	7.04	0.12	1.10	...	= 100.41.	
3. Brazil	63.34	27.66	1.15	...	0.69	...	7.09	...	0.98	...	= 100.91.	
4. Goshen, G. = 3.19	63.27	23.73	Fe ₂ O ₃	1.17	0.64	0.11	2.02	6.89	1.45	0.99	0.36	= 100.63.
5. Chesterfield, G. = 3.185-3.201	61.86	23.43	Fe ₂ O ₃	2.73	1.04	0.79	1.55	6.99	1.33	0.50	0.46	= 100.68.
6. Branchville, G. = 3.193 (2)	64.25	27.20	Fe ₂ O ₃	0.20	...	...	7.62	tr.	0.39	0.24	= 99.90.
7. Alexander Co., N. C., <i>Hiddenite</i> , G. = 3.152-3.189	64.35	28.10	Fe ₂ O ₃	0.25	...	...	7.05	...	0.50	0.15	= 100.40.
8. Alexander Co., N. C., <i>Hiddenite</i> , G. = 3.166	63.95	26.58	Cr ₂ O ₃	0.18	1.11	...	6.82	0.07	1.54	= 100.25.		

All of these analyses correspond more or less closely to the true formula (*Döller*) of the
 species, viz. : $Li_2Al_2Si_4O_{12}$; note the chromium found by *Genth* in *hiddenite* (anal. 8).

The variety of spodumene from Alexander Co., N. C. (anal. 7, 8), occurs in prismatic crys-
 tals from $\frac{1}{2}$ inch to 3 inches in length. The crystals are often highly modified, showing
 many planes not before observed on the species; they are often twins; the forms have
 been described by *E. S. Dana*, Am. J. Sc., III., xxii., 179. Perfectly transparent, and
 color from pale yellowish green to deep emerald green; those of the latter color are highly
 valued as gems, having a peculiar brilliancy, as compared with the emerald, in consequence
 of the pleochroism; the largest stone cut thus far weighs nearly $2\frac{1}{2}$ carats. They occur in
 cavities in a gneissoid rock, with emerald (q. v.), quartz, monazite, rutile, mica. The name
hiddenite was given by *Smith*, after W. E. Hidden, through whom they have been intro-
 duced as gems, and who has succeeded in finding them in place; those first found (by J.
 A. D. Stephenson) were of a pale yellowish-green color, and were obtained loose in the
 overlying soil.

The ALTERATION OF SPODUMENE at Goshen and Chesterfield, Mass., has been studied by
Julien, Ann. N. Y. Acad. Sc., i., 318, 1879; that of the Branchville mineral has been
 investigated by *G. J. Brush* and *E. S. Dana*, Am. J. Sc., III., xx., 257, 1880 (or Z. Kryst.,
 v., 192).

According to *Julien*, the Chesterfield crystals are often of immense size, reaching a
 length of 35 inches, and a diameter of 10 or 11 inches (see above 4, 5, for analyses of
 unaltered material). *Julien* describes pseudomorphs after spodumene of cymatolite, of
 killinite, of muscovite, of albite, of quartz, and of "vein granite." The substance (see
 below) called cymatolite by *Shepard*, has a fibrous to wavy structure, silky lustre, white
 color; $H = 1.5\text{-}2$; $G = 2.696\text{-}2.700$. The cymatolite from Goshen was earlier (*Eng. Min.*

J., xxii., 217) called *AGLAITE* by the same author. Analyses: 1, Manning Farm, Goshen; 2, Barrus Farm, Goshen; 3, Chesterfield Hollow.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	Li ₂ O	Na ₂ O	K ₂ O	H ₂ O	
1.	58.51	21.80	0.85	0.29	1.44	0.84	0.19	6.88	6.68	2.10*	= 99.88.
2. <i>Aglaite</i>	58.11	24.38	1.66	0.18	0.75	0.48	0.09	2.57	8.38	3.01†	= 99.61.
3.	(‡) 58.58	22.28	1.77	0.15	0.45	0.93	6.10	9.08	4.48	2.08‡	= 99.90.

* With nitrogenous organic matter 0.44.

† Do. 0.43.

‡ Do. undet.

The killinite has the following characters: H. = 3.5; G. = 2.623-2.652. Lustre dull and greasy to vitreous. Color greenish gray to olive green and greenish black. Analysis, Chesterfield Hollow:

SiO ₂	Al ₂ O ₃	FeO	MnO	CoO	MgO	CaO	Li ₂ O	Na ₂ O	K ₂ O	H ₂ O	
46.80	32.52	2.33	0.04	0.04	0.48	0.77	0.32	0.78	7.24	7.66,	organic matter 1.14
											[= 100.12.

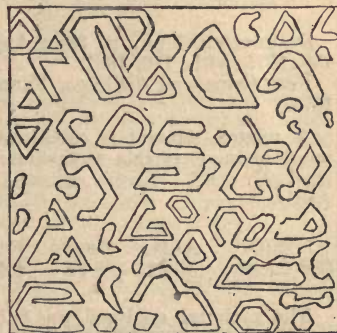
Brush and *Dana* describe, from Branchville, Ct., pseudomorphs after spodumene, of a substance called β spodumene (mixture of albite and eucryptite) of cymatolite (mixture of albite and muscovite), of albite, of microcline, of killinite, of "vein granite." The original crystals of spodumene (now mostly altered) were of great size, sometimes 4 feet long, 12 inches wide, and 2 to 4 inches thick. The unaltered spodumene occurring as a core in many large crystals is transparent, and either colorless or of a fine amethystine purple; for analysis see 6, above.

The first product of the alteration, resulting from the exchange of Na for one-half the Li, is a substance called β spodumene. It is compact, apparently homogeneous, with an indistinct fibrous to columnar structure. H. = 5.5-6. G. = 2.644-2.649. Color white, milky, or greenish white. Translucent. Fusibility, 2-25. Three analyses on material from different crystals gave nearly identical results. It is decomposed by HCl into two portions, one soluble and the other insoluble. Analyses by Penfield: 1, of the original material; 2, the soluble portion (32.10 p. e., calculated to 100); 3, insoluble portion (67.56 p. e., calculated to 100):

	SiO ₂	Al ₂ O ₃	Li ₂ O	Na ₂ O	K ₂ O	ign.	
1. β spodumene (‡)	61.51	26.56	3.50	8.14	0.15	0.29	= 100.15.
2. Soluble part	48.13	40.50	10.90	....	0.47	....	= 100.
3. Insoluble part	68.18	20.07	....	11.75	....	....	= 100.

The whole has the composition $(\text{Li}, \text{Na})_2\text{Al}_2\text{Si}_4\text{O}_{12}$, or $\text{Li}_2\text{Al}_2\text{Si}_2\text{O}_8 + \text{Na}_2\text{Al}_2\text{Si}_2\text{O}_{10}$. The insoluble part is albite ($\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_{10}$); the soluble portion is a new mineral called *eucryptite* ($\epsilon\upsilon\upsilon$, *well*, *κρυπτός*, *concealed*), and has the composition $\text{Li}_2\text{Al}_2\text{Si}_2\text{O}_8$. Examined under the microscope in thin sections (1) parallel to fibres, the irregular interlacing fibres of eucryptite are seen imbedded in albite; (2) transverse to fibres, the eucryptite forms bands with hexagonal outline (see figure), surrounded by albite, like quartz in a "graphic granite." See also *Eucryptite*, p. 44.

The second stage in the alteration is *cymatolite*; it results from β spodumene, by the exchange of K for the remaining Li, that is, the change of eucryptite to muscovite. The cymatolite has a fibrous or wavy structure. G. = 2.692-2.699; color white or slightly pinkish. Two analyses by Penfield, of independent specimens, gave essentially identical results; one of these is:



(‡)	SiO ₂	Al ₂ O ₃	MnO	Na ₂ O	K ₂ O	Li ₂ O	H ₂ O	
	60.55	26.38	0.07	8.12	3.34	0.17	1.65	= 100.28.

This corresponds to: $(\text{Na}, \text{K}, \text{H})_2\text{Al}_2\text{Si}_4\text{O}_{12}$, or $(\text{K}, \text{H})_2\text{Al}_2\text{Si}_2\text{O}_8 + \text{Na}_2\text{Al}_2\text{Si}_6\text{O}_{16}$. The microscopic examination shows that cymatolite is not, as previously assumed, a simple mineral, but, corresponding to the formula, a very uniform mechanical mixture of *muscovite* and *albite*. In some sections the transitions from β spodumene to cymatolite, *i. e.*, from eucryptite to muscovite, are clearly seen. In other cases the muscovite and albite have each segregated together, so that they are distinct. For example, in the figure, *s* = unaltered spodumene, $\beta = \beta$ spodumene, *c* = cymatolite, *g* = mica, *a* = albite.

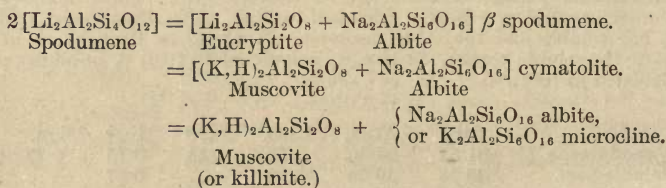


As further steps in the alteration there result: albite, often fibrous, like β spodumene, also muscovite, and granular microcline. Still again pseudomorphs occur of killinite. This often retains the structure of the spodumene. The color is light bluish green, to oil green and dark grass green. Analyses: 1, Penfield, of variety showing prismatic structure; 2, Dewey, of compact variety.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	CaO	K ₂ O	Na ₂ O	Li ₂ O	H ₂ O
1.	48.93	34.72	0.54	0.33	0.64	....	9.64	0.35	....	5.04 = 100.19.
2.	53.47	32.36	0.79	0.42	0.72	0.17	7.68	0.44	0.04	4.07 = 100.16.

The examination of thin sections under the microscope showed a slight want of homogeneity, and also revealed a very fine scaly micaceous structure; the killinite is doubtless to be regarded as an impure compact muscovite, like most other members of the pinitic group.

The following scheme explains the above changes of the spodumene, supposing an exchange of the alkali metal:



For further explanations reference must be made to the original papers.

STANNITE.—Min., p. 68; App. II., p. 52.

STAUROLITE, Min., p. 388; App. II., p. 52.—Cryst., *v. Kokscharof*, Min. Russl., vii., 159, 1875; viii., 110, 1881.

New twins and drillings, Fannin Co., Ga., *E. S. Dana*, Am. J. Sc., III., xi., 384, 1875.

A related mineral is called XANTHOLITE by *Heddle* (Min. Mag., iii., 59, 1879). In rough nodular crystals (monoclinic?), imbedded in biotite. Cleavage in one direction distinct. *H.* = 6.7. Lustre vitreous to pearly. Color yellowish brown. Fracture conchoidal. Analysis:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	CaO	MgO	H ₂ O	F
($\frac{2}{3}$)	27.12	45.91	8.64	6.91	0.53	3.67	4.41	2.88	0.09 = 100.16.

The material analyzed was not free from biotite. The larger crystals often contain small imbedded crystals, with one perfect cleavage, and of a dark green color, which, it is thought, may perhaps be the same mineral. Found with wollastonite, garnet, and zircon, near Milltown, Loch Ness, Scotland.

[The composition of the mineral, as remarked by *Heddle*, is essentially that of staurolite, and as the want of perfect homogeneity in the material analyzed is admitted, and as

staurolite is a species which is conspicuous for its inclosing impurities, no good reason can be given for separating this mineral from it. It does not deserve a name.]

Steatargillite. *E. F. Schmid*, Ber. Med.-Nat. Ges. Jena, July 9, 1880. A doubtful substance, filling, with quartz and ferrite, the small amygdaloidal cavities in the porphyritic rocks of the Höllekopf, at Kammerberg, and of the Tragberg, at Langewiesen, near Ilmenau. Massive, earthy. H. = 1·25. G. = 2·29-2·46. Color white to light green. Feel greasy. B. B. fuses to a greenish gray black specked enamel; yields much water in the tube, becoming black, and giving a bituminous odor. Analyses: 1, green, Höllekopf (insol. 6 p. c.); 2, green, Tragberg; 3, white, Höllekopf (insol. about 2 p. c.):

	SiO ₂	Fe ₂ O ₃	Al ₂ O ₃	FeO	MgO	CaO	H ₂ O
1. G. = 2·287	37·20	25·56	8·09	3·78	15·56	0·98	8·70* = 99·36.
2. G. = 2·465	32·77	17·73	11·12	12·51	14·19	0·91	9·77† = 99·00.
3. G. = 2·307	38·67	24·72	10·69	0·95	12·95	1·36	9·65‡ = 98·99.

* In vacuo, at ordinary temperature 1·91; at 100° 3·90.

† Do. 4·55, 2·52.

‡ Do. 0·70, 7·27.

[The author justly remarks that the material analyzed was not homogeneous. This is not a mineral species. Compare delessite, hullite (this App., p. 60), etc.]

Steeleite.—See *Mordenite*, p. 83.

STEPHANTE, Min., p. 106; App. II., p. 53.—**Cryst.**, Freiberg, Saxony, *Groth*, Min.-Samml. Strassburg, p. 69, 1878. *Przibram*, *Vrba*, Z. Kryst., v., 418, 1881.

Anal., *Przibram*, *Kolar*, Z. Kryst., v., 435, 1881.

STERCORITE, Min., p. 551.—**Anal.**, Guañape Islands, *Raimondi*, Min. Pérou, p. 28, 1878.

STERLINGITE.—App. II., p. 53 (15).

STERNBERGITE, Min., p. 54.—Recent analyses of minerals identical with or closely related to sternbergite: 1, Joachimsthal, Rammelsberg, Min. Chem. 2d ed., p. 66, 1875; 2, Andreasberg, Streng, J. Min., 1878, 794; 3, Joachimsthal, Janovsky, Z. Kryst., iii., 187, 1878; 4, Freiberg (argyropyrite of Weisbach, see below), Winkler, Jahrb. Berg.-Hütt., 1878; 5, 6, Joachimsthal (friescite of Vrba, see below), Preis, Z. Kryst., iii., 187, 1878.

	S	Ag	Fe
1.	29·10	35·27	35·97 = 100·34.
2.	30·71	32·89	35·89, Cu 0·19 = 99·74.
3.	33·14	30·03	34·67, SiO ₂ 1·32 = 99·16.
4. <i>Argyropyrite</i> , G. = 4·206	32·81	29·75	36·28 = 98·84.
5. <i>Friescite</i>	33·0	29·1	37·4 = 99·5.
6. <i>Friescite</i>	33·9	27·6	37·3 = 98·8.

To the above analyses, which show a continual increase in sulphur and iron, and a corresponding decrease in silver, Vrba (Z. Kryst., iii., 186) adds the *argentopyrite* of v. Waltershausen, which gave him S 34·2, Ag 26·5, Fe 39·3; Schrauf (Ber. Ak. Wien, lxiv., 192, 1871) has shown that this is not a pseudomorph (Min., p. 39), but an independent species (G. = 5·53) isomorphous with sternbergite. According to Streng (J. Min., 1878, 785), who describes crystals of "Silberkies" from Andreasberg (anal. 2 above), the composition of the above series of minerals may be expressed by the general formula Ag₃S + pFe_nSn_{n+1}, of which the first member is acanthite, and the second pyrrhotite; on the ground of this relation he is led to suggest that the latter mineral may be only pseudo-hexagonal (orthorhombic), and then it would be isomorphous with acanthite. Vrba regards this suggestion as not improbable.

Weisbach's argyropyrite (anal. 4, above) occurs at the Himmelfürst mine, at Freiberg, in small crystals, orthorhombic but pseudo-hexagonal, through twinning. Cleavage basal, perfect. H. = 2. G. = 4·206. Color on fresh fracture yellow bronze. Not brittle. Weisbach also found smaller crystals of similar form and color at Marienberg. H. = 4. G. = 4·06-4·12. Brittle.

Urba's frieseite (anal. 5, 6, above) is from Joachimsthal, Bohemia. In small, thick, tabular, and rectangular crystals; orthorhombic, and very near sternbergite in angle, also similarly twinned parallel $I(I \wedge I = 118^\circ 20')$. Cleavage basal, perfect. In thin laminae, flexible. Color pinchbeck to blackish brown. In very thin plates dark greenish gray, translucent. H. about 2. G. = 4.217. Associated with dolomite, smaltite, pyrrhotite, proustite, rittingerite. Z. Kryst., ii., 153, 1878; iii., 186, 1878; v., 426, 1881.

STELFELDTITE.—Min., p. 188; App. II., p. 53.

Stibianite. *E. Goldsmith*, Proc. Acad. Nat. Sc. Philad., 1878, 154.

An alteration product of stibnite, from Victoria, Australia. Massive, porous. Color reddish yellow, of powder pale yellow. Lustre dull. H. = 5. G. = 3.67. Analysis by W. H. Dougherty (l. e.): Sb_2O_5 81.21, H_2O 4.46, gangue 13.55. After deduction of the impurities: Sb_2O_5 94.79, H_2O 5.21 = 100, which corresponds to the formula $Sb_2O_5 + H_2O$. [So obviously impure a material cannot rank as a species. It is near stibiconite, but, according to Goldsmith, contains only Sb_2O_5 .]

STIBICONITE, Min., p. 188.—Anal. (by Santos) of a related mineral from Sevier Co., Arkansas, *Mallet*, Chem. News, xxxvi., 167, 1877. Borneo, *Frenzel*, Min. Mitth., 1877, 298. Chayramonte, Cajamarca, Peru, *Raimondi*, Min. Pérou, p. 196, 1878.

In extensive deposits in Sonora, Mexico, *E. T. Cox*, Am. J. Sc., III., xx., 421, 1880.

STIBIOFERRITE.—App. II., p. 53.

STIBIOTRIARGENTITE, **STIBIOHEXARGENTITE**.—App. I., p. 15.

STIBNITE, Min., p. 29; App. II., p. 53.—Cryst., Arnsberg, Westphalia, *Seligmann*, J. Min., 1880, i., 135.

Anal., Sevier Co., Ark., *Dunnington*, Amer. Assoc., 1877, 183. Several analyses, *C. E. Wait*, with description of occurrence in Arkansas, Trans. Amer. Inst. Min. Eng., viii., 43 et seq., 1880.

STILBITE, Min., p. 442; App. II., p. 53.—Monoclinic, according to *v. Lasaulx* (Z. Kryst., ii., 576, 1878), and isomorphous with harmotome and stilbite. On its chemical relations to these species, *Fresenius*, ib., iii., 42, 1878.

Anal. (sphaerostilbite), Annapolis Co., Nova Scotia, *How*, Phil. Mag., V., i., 134, 1876. Faroë, *Heddle*, Min. Mag., i., 91, 1877. San Piero, Elba, *Grattarola* and *Sansoni*, Att. Acc. Tosc., iv., 173, 1879; *Sansoni*, ib., p. 312. Miage Glacier, Mt. Blanc, *Cossa*, Acc. Line. Trans., III., v., 86, 1881.

See also *Foresite*, p. 47.

STILPNOMELANE, Min., p. 460.—Microscop. exam., *Fischer*, Z. Kryst., iv., 368, 1880.

STIRLINGITE.—App. II., p. 53 (49).

Strengite. *A. Nies*, J. Min., 1877, 8; *G. A. König*, Proc. Acad. Nat. Sc. Philad., 1877, 277.

Orthorhombic. Observed planes, $i-\bar{i}$, $i-\bar{j}$, 1. Axes, c (vert.): $\bar{b} : \bar{a} = 1.1224 : 1.1855 : 1$. $i-\bar{j} \wedge i-\bar{i} = 118^\circ 51'$, $i-\bar{i} \wedge 1 = 129^\circ 11'$, $1 \wedge 1 = 101^\circ 38'$ and $115^\circ 36'$ (terminal) = $111^\circ 30'$ (basal). Cleavage $i-\bar{i}$, imperfect. Crystals rare; in habit and angle near scorodite. Generally in spherical and botryoidal forms, aggregates with radiated fibrous structure, and drusy surface. H. = 3-4. G. = 2.87. Lustre vitreous, brilliant. Color peach-blossom red, carmine red, and various other shades; sometimes nearly colorless. Streak yellowish white. Translucent to transparent. Analyses: 1, Nies, after deducting 0.15 insol.; 2, König.

	P_2O_5	Fe_2O_3	H_2O	
1. Eleonore Mine	37.42	43.18	19.40	= 100.
2. Rockbridge Co.	39.30	42.30	19.87	= 101.47.

Formula $[\text{Fe}_2]\text{P}_2\text{O}_8 + 4\text{aq}$, which requires: P_2O_5 37.97, Fe_2O_3 42.78, H_2O 19.25 = 100. The mineral is isomorphous with scorodite, and closely related in composition to barrandite. In form also near reddingite. B. B. fuses readily to a black shining bead, coloring the flame bluish green. Iron reaction with borax. Dissolves easily in warm HCl ; in HNO_3 insoluble.

Occurs with cacoxenite, at the Eleonore iron mine, near Giessen; also in colorless crystals with eleonorite, at the Rothläufchen mine, near Waldgirmes, in the same region. In distinct crystals, pink to red, in cavities in dufenite, from Roekbridge Co., Va.; the crystals are different in habit from those described by Nies, and allow of only approximate measurements. Named after Prof. A. Streng, of Giessen.

STRIGOVITE.—App. II., p. 53.

STROMEYERITE.—Min., p. 54; App. II., p. 54.

STRONTIANITE, Min., p. 699; App. II., p. 54.—**Cryst.** description, new forms, twins like aragonite, Hamm, Westphalia, *Laspeyres*, Verh. Nat. Ver. Bonn, xxxiii., 308, 1876. Mifflin Co., Penn., *H. C. Lewis*, Proc. Ac. Nat. Sc. Phil., 1876, 11.

STRUVITE, Min., p. 551; App. II., p. 54.—**Cryst.**, *Sadebeck*, Min. Mitth., 1877, 113, 221; *vom Rath*, Ber. nied. Ges. Bonn, Jan. 7, 1878; anal. by *Mac Ivor*, ib., Jan. 13, 1879.

Stützite. *Schrauf*, Z. Kryst., ii., 245, 1878.

Monoclinic, with pseudo-hexagonal symmetry (clino-hexagonal). Crystals highly modified, 39 occurring planes; vertically striated in prismatic zone. Isomorphous with dyscrasite and chalcocite, and in form near jordanite. Lustre metallic. Color lead gray, with reddish tinge. Streak blackish lead gray. Fracture uneven to subconchoidal.

Composition uncertain, perhaps Ag_2Te , requiring Te 22.5, Ag 77.5 = 100. The silver percentage determined approximately with the blowpipe = 72 p. c. (1), = 77 p. c. (2). Easily fusible to a dark bead, from which a silver globule is obtained by reduction with soda.

Identified on a single specimen in the collection of the Vienna University; locality probably Nagyag, Transylvania. Associated with gold and hessite on quartz. Named after Stütz, who, in 1803, described a tellurium mineral from Nagyag, which was probably identical with this, and called it tellursilberblende.

STYPTICITE.—See *Fibroferrite*, p. 47.

Subdelessite.—See *Delessite*, p. 36.

Sulfuricin.—See *Melanophlogite*, p. 74.

Sulfatallophane.—See *Allophane*, p. 3.

SULPHATITE.—Min., p. 614; App. II., p. 54.

SULPHUR, Min., p. 20; App. II., p. 54.—**Cryst.**, *v. Kokscharof*, Min. Russl., vi., 368, 1874. *vom Rath*, Pogg. Ann., clv., 41, 1875. Sicily, *v. Zepharovich*, *Lotos*, 1876 (J. Min., 1876, 561); *Groth*, Min.-Samml. Strassburg, p. 8, 262, 1878; *Fletcher*, Phil. Mag., V., ix., 186, 1880.

SUSANNITE, Min., p. 626; App. II., p. 54.—See *Leadhillite*, p. 67.

SYLVANITE, Min., p. 81; App. II., p. 54.—**Cryst.** discussion of the system (monoclinic), *Schrauf*, Z. Kryst., ii., 211, 1878.

Anal. Grand View mine, Colorado, *F. W. Clarke*, Am. J. Sc., III., xiv., 286, 1877. Smuggler mine, Col., *Jennings*, Trans. Am. Inst. Min. Eng., vi., 507, 1877.

SYLVITE, Min., p. 111; App. II., p. 54.—*Vesuvius*, *Scacchi*, Att. Accad. Napoli, vi., 1873 (Contrib. Min., II., 23). A salt from Vesuvius, yielded *W. Smith*, KCl 67.13, NaCl 31.01, K_2SO_4 1.86 = 100, Ch. News, xxxvi., 57, 1877.

SYNGENITE.—App. II., p. 54.

Szaboite. *A. Koch*, Min. Petr. Mitth., i, 79, 350, 1878; *von Lasaulx*, Z. Kryst., iii., 288, 1879; *Gonnard*, Bull. Soc. Min., ii, 150, 184, 1879.

Triclinic; in minute (1 mm. long, .5 broad) thin tabular (*i-l*) prismatic crystals, terminated at one extremity and vertically striated; also acicular. $I \wedge I' = 87^\circ 15'$, $i-l \wedge I = 133^\circ 34'$. $H. = 6-7$. $G. = 3.505$. Lustre vitreous; on some planes tending to metallic and pearly. Color hair brown; in thinnest translucent crystals brownish red, hyacinth red. Streak tending to copper red. Translucent to opaque. Analysis:

SiO ₂	Fe ₂ O ₃ (Al ₂ O ₃ tr.)	CaO(MgO tr.)	Na ₂ O	ign.
52.35	44.70	3.12	tr.	0.40 = 100.57.

The calculated formula is Ca₂[Fe₂]₁₁Si₃₅O₁₀₅, or RSiO₃; but *v. Lasaulx* remarks that the iron is probably mostly present as FeO. B. B. fuses with difficulty; with borax an iron bead. Partially decomposed by HCl. Related in composition to babingtonite, and in form to the pyroxene group; most closely to rhodonite.

Occurs with pseudobrookite (*q. v.*) and tridymite, in cavities in the andesite of the Aranver Berg, Transylvania. Also on Mte. Calvario (Etna), near Biancaville, Sicily; also Riveau-Grand, Monte Dore. Named after Prof. J. Szabó, of Budapest.

Szmikite. *T. von Schröckinger*, Verh. Geol. Reichs., 1877, 115.

Amorphous, stalactitic, with botryoidal surface. $H. = 1.5$. $G. = 3.15$. Color whitish, on the fracture reddish white to rose red. Fracture earthy, splintery. Analyses: 1, Schrauf; 2, Dietrich, gave:

	SO ₂	MnO	H ₂ O	
1.	47.43	41.78	10.92	= 100.13.
2.	47.11	41.61	11.19	= 99.91.

These correspond to the formula: MnSO₄ + H₂O, requiring: SO₂ 47.43, MnO 42.01, H₂O 10.65 = 100. Exposed to damp air in small fragments becomes deeper red, and increases slightly in weight. From Felsöbanya, Transylvania. Named after Mr. Szmik, Counsellor of Mines.

TACHYLYTE, Min., p. 245.—Occurrence of a similar mineral in the basalt of Royat, Puy-de-Dôme, *Gonnard*, Bull. Soc. Min., iii., 211, 1880.

TALC.—Min., p. 451; App. II., p. 54.

TALCOSITE.—App. I., p. 15.

TAMMITE.—App. II., p. 55.

TANTALITE, Min., p. 514; App. II., p. 55.—From North Carolina, *König*, Proc. Ac. Nat. Sc. Phil., 1876, 39. Coosa Co., Ala., *J. L. Smith*, Am. J. Sc., III., xiv., 323, 1877. Yancey Co., N. C., analysis, *Comstock* (Am. J. Sc., III., xix., 131, 1880): (3) Ta₂O₅ 59.92, Cb₂O₅ 23.63, FeO 12.86, MnO 3.06, MgO 0.34 = 99.81. Massive. $G. = 6.88$.

¹ See also *Columbite*, p. 29.

A manganese variety is called MANGANTANTALITE by *A. E. Nordenskiöld* (Geol. Förh. Förh., iii., 284, 1877). In orthorhombic (?) crystals. Cleavage in one direction distinct, in two others less so; the last make with each other and with the first-named nearly right angles. $H. = 5.5-6$. $G. = 6.3$. Lustre vitreous. Color reddish to blackish brown; by transmitted light a fine red.

Composition given by the (approximate) analysis: Ta₂O₅(Cb₂O₅) 85.5, MnO 9.5, FeO 3.6, CaO 1.2 = 99.8. Formula, (Mn,Ca,Fe)Ta₂O₆, which requires: Ta₂O₅ 86.43, MnO 9.01, FeO 3.42, CaO 1.14 = 100. B. B. unaltered; gives a clear bead with salt of phosphorus; with soda a manganese reaction. Occurs with tourmaline, petalite, lepidolite, microlite, at Utö, Sweden. [The specific gravity leaves little doubt that the mineral contains considerable

columbic acid (say 30 p. c.), and is to be considered as a mere variety of tantalite or columbite. Compare the manganese columbite of Branchville, p. 29.]

TAPALPITE.—App. II., p. 55.

TAPIOLITE.—Min., p. 518; App. II., p. 55.

Tarapacaite. *Raimondi*, Minéraux du Pérou, p. 274, 1878. Occurs in minute fragments of a brilliant yellow color, in the midst of soda nitre (caliche). Essentially a potassium chromate, but mixed with a little sodium chloride, sodium nitrate, and sodium and potassium sulphates. From the province of Tarapaca, Peru; also (Domeyko, Min. Chili, 3d ed., 447) in the natural salt deposits of the desert of Atacama, Chili. [Needs further examination.]

Taznite. *Domeyko*, C. R., lxxxv., 977, 1877; Min. Chili, 3d ed., p. 298, 1879.

Amorphous, more or less fibrous in structure. Earthy. Color yellow. Soluble in hydrochloric acid. Regarded as an arsenio-antimonate of bismuth, analogous to bindheimite, and believed to have been derived from the alteration of some sulpharsenite or antimonate of bismuth. Very impure, from the admixture of varying quantities of bismuth ochre. An analysis gave: Bi_2O_3 (sol. in HNO_3) 42.00, Bi_2O_3 (united with Sb and As) 29.50, Sb_2O_3 5.29, As_2O_3 12.20, Fe_2O_3 7.00, H_2O 4.90, insol. 1.00 = 101.89. A second analysis gave: Bi_2O_3 51.35, Sb_2O_3 11.17, As_2O_3 16.54, Fe_2O_3 8.70, H_2O 4.54, insol. (silicates) 12.50 = 98.80. Obtained with other bismuth minerals from the mines of Tazna and of Choroloque, in Bolivia. [A heterogeneous substance.]

Telaspyrine. *C. U. Shepard*, Contrib. Min., 1877. Pyrite containing tellurium, from Sunshine Camp, Colorado.

TELLURITE, Min., p. 188.—In cracks in native tellurium, at the Keystone, Smuggler mines, and as an incrustation at the John Jay mine, Colorado. In minute prismatic crystals. Cleavable in one direction. Yellow to white. Composition, TeO_2 . *Genth*, Am. Phil. Soc. Philad., xvii., 118, 1877.

TELLURIUM, Min., p. 19; App. II., p. 55.—From various mines in Boulder County, Colorado, *Genth*, Am. Phil. Soc. Philad., xvii., 113, 1877.

Genth describes a peculiar variety from the Mountain Lion mine, which Berdell has called LIONITE. It occurs in thin plates. $H. = 3$. $G. = 4.005$. Color dark gray. Apparently homogeneous in appearance, but in fact containing 36 p. c. SiO_2 and 6 p. c. Al_2O_3 (Fe_2O_3).

TENNANTITE, Min., p. 104.—Anal., Wilhelmine mine, Seilauf, in the Spessart, *Petersen*, J. Min., 1881, i., 262.

Sandbergerite, from several localities in Peru, *Raimondi*, Min. Pérou, p. 115 et seq., 1878.

A variety of tennantite is called FREDRICITE by *H. Sjögren* (Geol. För. Förh., v., 82, 1880). Massive, compact. $H. = 3.5$. $G. = 4.65$. Lustre brilliant, metallic. Color and streak iron black; sometimes superficially tarnished green, red, brown. Opaque. Fracture uneven. Brittle. Analysis:

S	As	Sb	Sn	Cu	Pb	Ag	Fe
27.18	17.11	tr.	1.41	43.23	3.34	2.87	6.02 = 100.16.

Formula approximately 4RS , As_2S_3 , or that of tennantite, with, however, the unusual constituents, lead, tin, and silver. It also differs from tennantite in color and texture. B. B. decrepitates and fuses easily to a black shining mass, which gives a copper bead with soda. In the closed tube gives a sublimate of arsenic trisulphide. Attacked slightly by HCl ; decomposed by strong HNO_3 , with the separation of lead sulphide and arsenic trioxide. Occurs in small masses imbedded in geocronite. Associated with galenite at Falu, Sweden.

TENORITE, Min., p. 136.—Triclinic, according to *Kalkowsky*, chiefly on optical grounds, Z. Kryst., iii., 279, 1879.

A product of the alteration of tenorite is called *ATELINA* (atelite) by *Scacchi* (Att. Accad. Napoli, vi., Dec. 13, 1873). Observed as more or less complete pseudomorphs after tenorite, and formed by the action on the latter of hydrochloric acid; as a result the black color is changed to green. An analysis gave: CuO 45.59, CuCl₂ 38.13, H₂O and loss 16.22 = 100. This corresponds to 2CuO + CuCl₂ + 3H₂O, or CuCl₂ + 2(H₂CuO₂) + H₂O, which requires: CuO 45.76, CuCl₂ 38.68, H₂O 15.56 = 100. Found at Mt. Vesuvius, as a result of the eruption of April, 1872. [Not far from atacamite.]

TEPHROITE, Min., p. 259; App. II., p. 55.—Anal., Långban, Sweden, *Pisani*, C. R., lxxxiv., 1511, 1877. An analysis of picrotephroite, from Långban, Wermland, Sweden, gave *S. R. Paikull*: SiO₂ 33.70, MnO 51.19, CaO 0.95, MgO 12.17, ign. 0.44 = 98.45; Geol. För. Förh., iii., 351, 1877.

TEQUEZQUITE. Corruption of Tequixquilt, a mineral substance formed of mixtures of different salts, especially sodium carbonate, and sodium chloride; from Texcoco, Zumpango, in the Valle de Mexico, and elsewhere in Mexico. *Naturaleza*, iii., 239-246, 1875.

TETRADYMITITE.—Min., p. 30; App. II., p. 55.

TETRAHEDRITE, Min., p. 108; App. II., p. 55.—Cryst., twins, *Kopp*, J. Min., 1877, 62. Horhausen, *Seligmann*, Z. Kryst., i., 335, 1877; *Groth*, Min.-Samml. Strassburg, p. 66, 1878. Horhausen, *vom Rath*, Z. Kryst., v., 258, 1880.

Analyses, Newburyport, Mass., *Miss E. H. Swallow*, Proc. Bost. Nat. Hist. Soc., xvii., 465, 1875. Clara mine, Schappbachthal, *Mutschler*, Ann. Ch. Pharm., clxxxv., 206. Gärdsjön, Wermland (aphtonite), *Nilson*, Z. Kryst., i., 417, 1877. Kahl, near Biber, Hesse, with Co 0.50, As 2.6, *Mutschler*, Jahrb. Min., 1877, 275. Brixlegg, Tyrol, *Untchj and Becke*, Min. Mitth., 1877, 273, 274. Huallanca, Peru, occurrence described, *H. Sewell*, Am. J. Sc., III., xv., 317, 1877; anal. by *Comstock*, *ibid.*, xvii., 401, 1869. Hungary, *Hidegh*, Min. Mitth., ii., 350, 1879. Mine d'Araqueda, Cajabamba, Peru, *Raimondi*, Min. Pérou, p. 114, 1878. Arizona (16.23 Pb), *Clarke and Owens*, Am. Chem. Journ., ii., 173, 1880.

Recent formation at Bourbonne-les-Bains, *Daubrée*, C. R., lxxx., 463, 1875.

A variety is called *MALINOFSKITE* by *Raimondi* (Domeyko, 5th Append. Min. Chili, 1876; also *Raimondi*, Min. Pérou, p. 122, 1878). Occurs massive. Color gray with a metallic lustre. An analysis gave: S 24.27, Sb 24.74, As 0.56, Pb 13.08, Cu 14.37, Ag 11.92, Fe 9.12, Zn 1.92 = 100. Remarkable for its high percentage of lead. From the mines of Carpa and Llaccha (above anal.), district of Recuay, Peru.

Another mineral, near tetrahedrite, is called *FRIGIDITE* by *A. D'Achiardi*. Rarely crystallized; generally granular, compact, massive, with a subconchoidal structure. H. = 4. G. = 4.8. Lustre metallic. Color grayish steel. Powder grayish black. B. B. fuses easily, yielding copious antimonial fumes. Analysis by *A. Funaro*:

S	Sb	Cu	Fe	Ni	Ag	Zn	SiO ₂	
29.60	25.59	19.32	12.67	7.55	0.04	tr.	2.20	= 96.97.

This does not correspond very closely with ordinary tetrahedrite, nor with the mineral called *COEPITE* by *Bechi*, from this same locality, and for which he obtained: S 27.01, Sb 29.61, Cu 30.10, Fe 13.08 = 99.80 (referred to tetrahedrite by *D'Achiardi*, Min. Tosc., ii., 341, 1873). [In view, however, of the incompleteness of *Funaro's* analysis (3 p. c. loss, 2 p. c. gangue), the calculation of a formula has but little value.] From the mines in the Valle del Frigido, Apuan Alps.

Thaumasite. *Nordenskiöld*, C. R., lxxxvii., 314, 1878; *Lindström*, Öfv. Ak. Stockh., Nov. 13, 1878.

Massive, compact. H. = 3.5. G. = 1.877. Lustre greasy, dull. Color white. Translucent. Fracture subconchoidal. Analyses by *Lindström*, on material collected, 1, by *Polheimer*, about 1805; 2, by *Nordenskiöld*, 1859; and 3, by *Engberg*, 1878:

	SiO ₂	CO ₂	SO ₂	CaO	H ₂ O	Al ₂ O ₃	MgO	Na ₂ O	K ₂ O	Cl	
1.	9.62	6.90	13.12	27.43	42.16	0.17	tr.	0.18	0.07	0.13	= 99.78.
2.	9.70	6.81	12.59	27.17	41.80	0.17	....	0.07	0.07	0.14	= 98.52.
3.	9.78	6.88	13.34	27.24	42.63	0.13	....	0.07	0.10	0.10	= 100.27.

The formula calculated by Lindström is $\text{CaSiO}_3 + \text{CaCO}_3 + \text{CaSO}_4 + 14\text{aq}$, which requires: SiO_2 9.93, CO_2 7.28, SO_3 13.25, CaO 27.82, H_2O 41.72 = 100. B. B. swells up, colors the flame red, but infusible. In salt of phosphorus a skeleton of silica. In the closed tube decrepitates and gives off much water.

Occurs filling cavities and crevices at the Bjelke mine, near Aareskuta, Jemtland, Sweden; at first soft, but hardens on exposure to the air. A fine fibrous chalk-white mineral occurs with it, and is regarded as a decomposition product; $\text{H} = 1.5-2.5$. Composition: SiO_2 11.85, CO_2 6.86, SO_3 13.31, CaO 25.74, Al_2O_3 (Fe_2O_3) 2.58. Named from *Σαυμαζω*, to be surprised, in allusion to the remarkable composition.

Törnebohm (quoted by Lindström) states that the material analyzed was homogeneous under the microscope, having a fibrous structure. Bertrand (Bull. Soc. Min., iii., 159; iv., 8) states that he identified calcite, gypsum, and a third mineral, probably wollastonite, in thaumasite, and hence regards it as a mixture; he states that chemical trials by Damour confirm this conclusion. Nordenskiöld, however (Geol. För. Förh., v., 270, 1880), claims that Bertrand's observations were not made on the pure mineral, and that the mixture proposed would not have the above composition. Finally, Cohen confirms by microscopic examination the essentially homogeneous (J. Min., 1881, ii., 21 ref.) appearance; he separated some gypsum and a carbonate soluble in acetic acid, but does not regard the matter as settled. A further critical examination is needed, in view of the seemingly very improbable composition deduced.

THENARDITE, Min., p. 615.—Province of Arequipa, Peru, *Raimondi*, Min. Pérou, p. 287, 1878. Balchaschsee, Central Asia, *vom Rath*, Z. Kryst., iv., 430; Ber. nied. Ges. Bonn, Aug. 4, 1879.

Occurs in large deposits on the Rio Verde, Arizona, *B. Silliman*, Am. J. Sc., III, xxii., 204, 1881. An analysis of this by Dunham gave: ($\frac{1}{2}$) SO_3 56.36, Na_2O [43.02], CaO 0.12, MgO 0.02, Cl 0.10, insol. 0.38 = 100.

From Aguas Blancas, Atacama, *cryst. anal.*, *Bärwald*, Z. Kryst., vi., 36, 1881.

Thinolite.—See *Gay-Lussite*, p. 51.

THOMSENOLITE, Min., p. 129; App. II., p. 55.—See *Pachnolite*, p. 88.

THOMSONITE, Min., p. 424; App. II., p. 55.—Cryst. form determined with accuracy. $I \wedge I = 90^\circ 26'$, c (vert.): $b : d = 1.0095 : 1 : 0.9925$, from Is. Laaven, Langesundfjord, Norway, *Brögger*, Z. Kryst., ii., 289, 1878.

Anal., Grand Marais, Minn., *König*, Nat. Leisure Hour, 1878, No. 8. Monzoni, *John*, Verh. Geol. Reichs., 1875, 305.

Peckham and *Hall* (Am. J. Sc., III., xix., 122, 1880) describe in detail the thomsonite amygdules from the diabase of Grand Marais, Lake Superior. These occur in place, and also as polished pebbles on the shores of the lake. Three varieties are distinguished: I., opaque white, resembling porcelain, with conchoidal or occasionally fibrous structure; II., in spherical or ellipsoidal forms, with fibrous radiated structure; sometimes with several centres, often flesh-red, with zones of green, red, and white; III. (called LINTONITE), structure fine granular, not radiated or crystalline, and of green color; sometimes this variety forms a centre surrounded by either var. I. or II. Hardness of the different forms 5-6. $G = 2.33-2.35$; 2.2 in weathered pebbles. Analyses by Miss L. A. Linton: 1, var. I.; 2, var. II.; 3, calculated from 2, on the assumption that the true amount of SiO_2 is 40.45 p. c. (as in 1), the remainder being due to free quartz; 4, var. III.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	Na_2O	K_2O	H_2O
1.	40.45	29.50	0.23	....	10.75	4.76	0.36	13.93 = 99.98.
2.	46.02	26.72	0.81	....	9.40	3.76	0.39	12.80 = 99.90.
3.	40.45	29.37	0.88	....	10.43	4.28	0.42	13.93 = 99.76.
4. <i>Lintonite</i> .	40.61	30.21	....	0.40	10.37	4.06	0.49	13.75 = 99.89.

The analyses prove that all the specimens examined are the same species, thomsonite. The polished pebbles are often of great beauty, and are highly valued for ornaments.

THORITE, Min., p. 413; App. II., p. 55.—Arendal, Norway, crystals in form of zircon (pseudomorphs), and analysis, *Nordenskiöld*, Geol. För. Förh., iii., 226, 1876. *Hitterö*, *Lindström*, ib., v., 500, 1881.

A mineral related to thorite, but differing in the large percentage of uranium present, has been described by Collier (Journ. Am. Ch. Soc., ii, 73, 1880) under the name URANOTHORITE. Massive. H. = 5. G. = 4.126. Lustre resinous to subvitreous. Color dark red brown. Streak yellow brown. Fracture subconchoidal. An analysis by H. B. Parsons yielded:

SiO ₂	ThO ₂	U ₂ O ₃	Fe ₂ O ₃	Al ₂ O ₃	PbO	CaO	MgO	Na ₂ O	H ₂ O
19.38	52.07	9.96	4.01	0.33	0.40	2.34	0.04	0.11	11.31 = 99.05.

B. B. infusible. From the Champlain iron region, N. Y., exact locality unknown.

THROMBOLITE, Min., p. 562.—*Schrauf* (Z. Kryst., iv., 28, 1879) obtained G. = 3.67, also: CuO 39.44, Fe₂O₃ 1.05, H₂O 16.56, Sb₂O₃ 6.65, Sb₂O₃ 32.52, loss 3.78 = 100. Whether this is a true compound or only a mixture is uncertain; if the former, the mineral belongs with the no less uncertain steteefeldtite, partzite (Min., p. 188) and rivotite (App. II., p. 48).

THURINGITE, Min., p. 507.—Cryst. and anal., Zirmsee, Carinthia, v. *Zepharovich*, Z. Kryst., i., 371, 1877; ii., 195, 1878.

Tincalconite. *C. U. Shepard*. Borax from California, pulverulent and efflorescent, 32 p. c. water, Bull. Soc. Min., i., 144.

TITANITE, Min., p. 383; App. II., p. 55.—Cryst., in mica schist, Lama della Spedalacio, *Uzielli*, Accad. Linc. Mem., III., i., 158, 1877. Albani Mts., *Sella*, Z. Kryst., i., 250, 1877. Tyrol, *W. J. Lewis*, Phil. Mag., V., iii., 455, 1877. Zermatt (greenovite), *Hünzle*, Z. Kryst., ii., 310, 1878. Finland, *F. J. Wiik*, Z. Kryst., ii., 496; *Groth*, Min.-Samml. Strassburg, p. 252, 1878. Zöptau, *vom Rath*, Z. Kryst., v., 255, 1880. Ilmen Mts., v. *Jeremejef*, Verh. Min. Ges. St. Pet., II., xvi., 254, 1881.

Absorption of light measured photometrically, *Pulfrich*, Z. Kryst., vi., 155, 1881.

Optical determination in thin sections of rocks, *Fouqué* and *Lévy*, Ann. Min., VII., xii., 437, 1877.

Anal., Waldheim, Saxony (0.88 Y.₂O₃), *Schmöger*, ZS. G. Ges., xxvii., 204, 1875. Grenville, Canada, *Harrington*, Geol. Canada, 1878.

In enormous crystals, with apatite, from Renfrew, Canada, sometimes weighing 72 lbs. (Kunz).

A variety of titanite from Småland, Sweden, is called ALSHEDITE by *C. W. Blomstrand* (Minneskrift Fys. Sällsk. Lund, 1878, p. 7). Occurs in imperfect crystals, sometimes small, sometimes 1-1.5 in. in length; also massive, imbedded in quartz. Form uncertain, probably similar to titanite (Topsøe); two cleavages inclined 125½°. H. = 3.36. G. = 5. Color pale brown to ash gray. Opaque. B. B. readily fusible to a black bead; soluble in HCl. Analysis: 1, mean of 5 more or less complete analyses; 2, mean of 3 analyses:

	SiO ₂	TiO ₂	SnO ₂	Al ₂ O ₃	Fe ₂ O ₃	Y ₂ O ₃	CaO	MnO	MgO	K ₂ O, Na ₂ O	H ₂ O
1. (5)	28.26	36.61	0.47	3.41	4.25	2.78	21.06	0.98	0.48	0.70	1.20 = 100.17.
2. (3)	30.61	35.86	0.38	3.47	3.61	2.57	20.51	0.82	0.32	0.58	1.89 = 100.62.

The mineral consequently falls between titanite and keilhauite, and is not far from grothite, Min., p. 386.

Titanomorphite. *A. von Lasaulx*, J. Min., 1879, 568; Z. Kryst., iv., 162, 1879.

Monoelnic; isomorphous with titanite, with corresponding planes and angles. Usually in granular aggregates, often with fibrous structure, surrounding kernels of rutile, or of rutile and menaccanite (nigrin), or menaccanite alone, from the alteration of which it has arisen. Color white. Optically biaxial (microscope), with interference figures resembling those of titanite ($\rho > \nu$), $2E = 45^\circ - 50^\circ$; positive. Analysis by Bettendorff:

TiO ₂	CaO	FeO
74.32	25.27	tr. = 99.59.

This corresponds to CaTi_2O_7 , or a calcium titanate. B. B. fuses to a gray glass. With salt of phosphorus gives a reaction for titanium; by HCl partially, by H_2SO_4 completely decomposed.

From the hornblende schists of the "hohe Eule," Lampersdorf, Silesia. Lasaulx regards the white decomposition product of titanite iron, often observed, especially in hornblende rocks, and called LEUCOXENE by Gümbel, as identical with titanomorphite; this would seem, however, to require further proof. Compare remarks by C. W. Cross, *Min. Petr. Mitth.*, iii., 491, 1880. [According to Groth (*Tab. Uebers. Min.*, p. 118, 1882), *Knop* states that titanomorphite is identical with titanite.]

TOCORNALITE, *App. II.*, p. 56.—Several chloro-iodides of silver and mercury are described by *Domeyko*, 5th *App.*, p. 40, 1876; 6th *App.*, p. 30, 1878; 3d ed. *Min. Chili*, p. 430 et seq., 1879.

TOPAZ, *Min.*, p. 376; *App. II.*, p. 56.—*Cryst.*, Framont, and optical exam., *Bertrand*, *Z. Kryst.*, i., 297, 1877. Saxony and Bohemia, *Laspeyres*, *Z. Kryst.*, i., 374, 1877. Ilmen Mts., v. *Jeremejev*, *Verh. Min. Ges. St. Pet.*, II., xiii., 416. Durango, Mexico, *Des Cloizeaux*, *J. Min.*, 1878, 40. Russian, *Seligmann*, *Z. Kryst.*, iii., 80, 1878. Mt. Bischof, Victoria, vom *Rath*, *Ber. nied. Ges. Bonn*, Jan. 13, 1879. Elba, *Corsi*, *Z. Kryst.*, v., 604, 1881.

Pseudo-orthorhombic (monoclinic), according to the view of *Mallard*, *Ann. Min.*, VII., x., 155, 1876.

Crystallogenic discussion, *Scharff*, *J. Min.*, 1878, 168. Specific gravity determinations, *Church*, *Geol. Mag.*, II., ii., 322, 1875. Inclusions, CO_2 , etc., *Hartley*, *J. Ch. Soc.*, March, 1877, 241; *Erhard* and *Stelzner*, *Min. Petr. Mitth.*, i., 450, 1878; *A. A. Julien*, *J. Amer. Ch. Soc.*, iii., 41, 1881.

Anal. (pycnite), Cerro del Mercado, Durango, Mexico, *Chrustschoff*, *Z. Kryst.*, iii., 634, 1879. Loss upon ignition, *Rammelsberg*, *Wied. Ann.*, vii., 147, 1879.

Altered to muscovite (damourite), *Frenzel*, *Min. Petr. Mitth.*, iii., 513, 1881. Pyrophyllite altered to massive damourite, Kårarfvet, Fahlun, Sweden, *Atterberg*, *Geol. För. Förh.*, ii., 402, 1875.

TORBANITE, *Min.*, p. 742.—*Liversidge* describes the so-called "kerosene shale" of New South Wales, and refers it to torbanite; this is the substance called wollongongite, which name, however, is not appropriate, as the specimen described came not from Wollongong, but from *Hartley*, *Proc. Roy. Soc. N. S. W.*, Dec. 8, 1880.

Tobermorite. *Heddle*, *Min. Mag.*, iv., 119, 1880.

Massive, fine granular. $G. = 2.423$. Color pale pinkish white. Translucent. Analyses: 1, Tobermory; 2, north of Tobermory, toward Bloody Bay.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	K_2O	Na_2O	H_2O
1.	46.51	2.40	1.14	1.85	33.40	0.47	1.45	0.36	12.61 = 100.19.
2. $G. = 2.423$	46.62	3.89	0.66	1.08	33.98	....	0.57	0.89	12.11 = 99.81.

Occurs filling cavities in the rocks near Tobermory, Island of Mull. [Very near gyro-lite, if not identical with it.]

TORBERNITE.—*Min.*, p. 585; *App. II.*, p. 56.

TOURMALINE, *Min.*, p. 365; *App. II.*, p. 56.—In crystals as an outer shell, enveloping orthoclase, from Port Henry, N. Y., *E. H. Williams*, *Am. J. Sc.*, III., xi., 273, 1876. Pseudo-rhombohedral, analogous to beryl and apatite, according to the view of *Mallard*, *Ann. Min.*, VII., x., 150, 1876.

Power of conducting heat and electricity, *S. P. Thompson* and *O. J. Lodge*, *Phil. Mag.*, V., viii., 18, 1879; *ib.*, x., 67, 1880; same subject, *Fitzgerald*, *Sc. Proc. Dubl. Soc.*, II., i., 370, 1880. Specific gravity determinations, *Church*, *Geol. Mag.*, II., ii., 322, 1875. Relation of electrical conductivity to absorption of light, with reference to Maxwell's theory, *S. P. Thompson*, *Phil. Mag.*, V., xii., 112, 1881. Absorption of light measured photometrically, *Pulfrich*, *Z. Kryst.*, vi., 151, 1881. Electricity produced by pressure, *Jacques* and *Pierre Curie*, *C. R.*, xcii., 186, 1881.

Anal., in dolomite at Campo Longo, Elba, *Engelmann*, *Z. Kryst.*, ii., 312, 1878.

Occurrence of red and green varieties at Wolkenburg, Saxony, *Credner*, *Ber. Ges. Leipzig*, ii., 49 (*J. Min.*, 1877, 528). As a contact mineral adjoining a granite vein, Mt. Willard, N. H., *Hawes*, *Am. J. Sc.*, III., xxi., 21, 1881.

TRAUTWINITE.—App. II., p. 56.

TRIDYMITÉ, *Min.*, p. 805; App. II., p. 56.—Pseudo-hexagonal through twinning (trigonal), as shown by an optical examination by *Schuster*, *Min. Petr. Mitth.*, i., 71, 1878, and nearly the same time independently by *v. Lasaulx*, *Z. Kryst.*, ii., 253, 1878.

In white ashes ejected from the island Vulcano, *Baltzer*, *ZS. G. Ges.*, xxvii., 57, 1875.

Made artificially, *Hautefeuille*, *C. R.*, lxxxiii., 1133, 1194, 1878 (*Bull. Soc. Min.*, i., 1, 1878). Found with zinc spinel in a zinc furnace, as products of the alteration of the zinc muffles, *Schulze* and *Stelzner*, *J. Min.*, 1881, i., 121.

See also *Asmanite*, p. 10.

TRINKERITE.—App. I., p. 16.

TRIPHYLITE, *Min.*, p. 541.—Analyses by S. L. Penfield: 1, Bodenmais, Bavaria, color light blue, G. = 3.549; 2, Norwich, Mass., color grayish green, G. = 3.534 (*Am. J. Sc.*, III., xvii., 226, 1879); 3, Grafton, N. H., color light blue, G. = 3.52, *ib.*, xiii., 426, 1877.

	P ₂ O ₅	FeO	MnO	CaO	MgO	Li ₂ O	K ₂ O	Na ₂ O	H ₂ O	gangue	
1. (2/3)	43.18	36.21	8.96	0.10	0.83	8.15	....	0.26	0.87	0.83	= 99.39.
2. (2/3)	44.76	26.40	17.84	0.24	0.47	9.36	....	0.35	0.42	....	= 99.84.
3. (2/3)	44.03	26.23	18.21	0.94	0.59	8.79	0.32	0.12	1.47	....	= 100.70.

These correspond closely to the formula: $\overset{1}{R}RPO_4 = \overset{1}{R}PO_4 + \overset{2}{R}P_2O_8$, which is thus proved to be the true composition of the species.

TRIPHYLITE—LITHIOPHILITE. *G. J. Brush* and *E. S. Dana*, *Am. J. Sci.*, III., xvi., 118, 1878; *ibid.*, xviii., 45, 1879.

Orthorhombic. Cleavage: basal highly perfect; brachydiagonal nearly perfect; prismatic interrupted, $I \wedge I = 130^\circ$. Massive. H. = 4.5. G. = 3.424–3.482. Lustre vitreous to resinous. Color, salmon color, honey yellow, yellowish brown, light clove brown. Streak uncolored. Transparent to translucent. Fracture uneven to subconchoidal. Optic-axial plane in the basal section; acute bisectrix, positive, normal to brachypinacoid. Axial angle in oil ($n = 1.47$), $74^\circ 45'$ red, $79^\circ 30'$ blue. Axial colors, α deep pink, c (vert.) pale greenish yellow, δ faint pink.

Composition: $LiMnPO_4$, or $Li_3PO_4 + Mn_3P_2O_8$, with the manganese partly replaced by iron. Percentage composition: P₂O₅ 45.22, MnO 45.22, Li₂O 9.56 = 100. Analyses: 1, H. L. Wells (*ib.*, xvi., 118); 2, S. L. Penfield (*ib.*, xviii., 47):

	P ₂ O ₅	FeO	MnO	Li ₂ O	Na ₂ O	H ₂ O	gangue	
1. G. = 3.478	(2/3) 44.67	4.02	40.86	8.63	0.14	0.82	0.64	= 99.78, Wells.
2. G. = 3.482	(2/3) 45.22	13.01	32.02	9.26	0.29	0.17	0.29	= 100.26, Penfield.

The composition is analogous to that of triphylite (q. v.), of which it is properly a variety peculiar in that it contains mostly manganese in place of iron. In the closed tube gives traces of moisture, turns dark brown and fuses, but does not become magnetic. Fuses in the naked lamp-flame, and B. B. gives an intense lithia-red flame, streaked with pale green on the lower edge. With fluxes reacts for manganese (O. F.) and iron (R. F.). Soluble in acids.

Occurs at Branchville, Fairfield Co., Conn., in a vein of albitic granite. In irregular masses intimately associated with spodumene (and cymatolite, q. v.), also with eosphorite, triploidite, rhodochrosite, uraninite. Named from *lithium* and *φιλός*, friend.

At the above locality there is found a large quantity of a black mineral derived from the alteration of lithiophilite, as shown both by its composition and by the fact that it retains more or less of the structure of the original mineral, and sometimes incloses a

nucleus of it. It is generally grayish to pitch black, with sometimes a purple or violet tinge. $H. = 3-4$. $G. = 3.26-3.40$. Analyses: 1, F. P. Dewey, *ib.*, xvii., 367; 2, H. L. Wells, *ib.*, xvii., 368.

	P_2O_5	Fe_2O_3	Mn_2O_3	MnO	Li_2O	Al_2O_3	CaO	K_2O	Na_2O	H_2O	insol.
1. $G. = 3.395$ ($\frac{2}{3}$)	40.66	12.56	25.27	11.66	5.66	0.10	0.18	....	0.49	3.07	....
											MgO tr. = 99.65.
2. $G. = 3.265$ ($\frac{2}{3}$)	40.38	15.89	14.71	18.80	4.83	....	0.72	0.26	tr.	3.37	0.90 = 99.86.

TRIPLITE, *Min.*, p. 543; *App. II.*, p. 56.—From Helsingfors, Finland, *F. J. Wiik*, *Øfv. Finsk. Vet. Soc.*, xvii., 7, 184-5.

Triploidite. *G. J. Brush* and *E. S. Dana*, *Am. J. Sci.*, xvi., 42, 1878.

Monoclinic. Axes, c (vert.): $b : d = 0.80367 : 0.53846 : 1$; $\beta = 71^\circ 56'$. Observed planes (see figure): O (c), $i-i$ (b), $i-i$ (a), I , $1-i$ (e), $2-2$ (p). $I \wedge I = 59^\circ 6'$, $c \wedge I = 98^\circ 53'$, $c \wedge e = 125^\circ 13'$, $c \wedge p = 103^\circ 25'$, $a \wedge p = 127^\circ 11'$. Crystals striated vertically. Commonly in crystalline aggregates, parallel-fibrous to columnar; also divergent, or confusedly fibrous to nearly compact, massive. Cleavage: orthodiagonal perfect.

$H. = 4.5-5$. $G. = 3.697$. Lustre vitreous to greasy adamantine. Color yellowish to reddish brown, in isolated crystals also topaz to wine yellow, occasionally hyacinth red. Streak nearly white. Transparent to translucent. Fracture subconchoidal. The axes of elasticity in the clinodiagonal section nearly coincide respectively with the vertical axis (3° to 4° behind), and a normal to the orthopinacoid. No color absorption.

Composition: $R_1P_2O_5$, H_2O or $R_2P_2O_5 + R(OH)_2$. If $R = Mn : Fe = 3 : 1$, percentage composition: P_2O_5 31.91, FeO 16.18, MnO 47.86, H_2O 4.05 = 100. Analyses of two varieties by S. L. Penfield:

	P_2O_5	FeO	MnO	CaO	H_2O
1. ($\frac{2}{3}$)	32.11	14.88	48.45	0.33	4.08 = 99.85.
2	32.24	18.65	42.96	undet.	4.09, quartz 1.09.

In the closed tube gives off neutral water, turns black and becomes magnetic. Fuses quietly in the naked lamp-flame, and B. B. in the forceps colors the flame green. Reacts for manganese and iron in the fluxes. Soluble in acids.

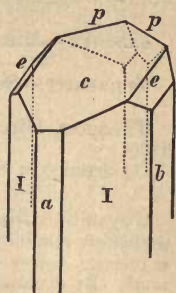
Occurs at Branchville, Fairfield Co., Conn., intimately associated with cosphorite, dickinsonite, lithiophilite, and other species, in a vein of albitic granite. In crystalline form triploidite is very similar to wagnerite, and as the formulas of the latter species and of triploidite are closely analogous ($R_3P_2O_5 + RF_2$), it is concluded that the three species are isomorphous; in triploidite, the hydroxyl (OH) takes the place of the fluorine. Named from triploidite and *ειδος*, *form*, in allusion to the close similarity between the two species.

Trippkeite. *Damour* and *vom Rath*, *Z. Kryst.*, v., 245, 1880 (or *Bull. Soc. Min.*, iii., 175).

Tetragonal; c (vert.) = 0.9160. Observed planes: O , $i-i$, I , 1 , $\frac{1}{2}$, 3 , $\frac{3}{2}-3$, $\frac{3}{2}-3$, $\frac{1}{2}-2\frac{1}{2}$. Cleavage parallel, $i-i$ perfect, I a little less so (*vom Rath*). Optically uniaxial, positive (*Des Cloizeaux*). In small brilliant crystals (1 to 2 mm.), of a bluish-green color.

According to a qualitative examination by *Damour*, essentially an arsenite of copper ($nCuO, As_2O_3$). Easily soluble in HNO_3 and HCl . B. B. in the closed tube becomes emerald green on slight heating, then the green disappears and the color becomes brownish; on continued ignition the color becomes yellowish green a second time. Fuses easily to a green slag. In the open tube gives crystals of arsenic trioxide. Occurs with olivenite, as an older formation, in druses in massive cuprite from Copiapo, Chili. Named after the young mineralogist, Dr. Paul Trippke, who died June 16, 1880. [Needs further examination on the chemical side.]

Tritochorite.—See *Eusynchite*, p. 44.



TRITOMITE, Min., p. 412.—Brevig and Barkevig, Norway, complete analyses, *Engström*, Inaug. Diss. Upsala, 1877 (Z. Kryst., iii., 200).

TRÖGERITE.—App. I., p. 16; II., p. 56.

TROLLITE, Min., p. 57; App. II., p. 57.—Composition, FeS (not Fe₇S₈, Meunier, App. II., p. 57), according to analyses of *J. Laurence Smith*, C. R., lxxxii., 976, 1875.

TSCHEFFKINITE.—Min., p. 387; App. II., p. 57.

TSCHERMAKITE, App. II., p. 57.—Conclusion of Hawes, that tschermakite is only an ordinary triclinic feldspar, confirmed by *Bauer*, ZS. G. Ges., xxvii., 235 et seq., 1875.

TURGITE.—Min., p. 167; App. II., p. 57.

TURNERITE.—See *Monazite*, p. 82.

TURQUOIS, Min., p. 580.—Microscopic examination, *Bucking*, Z. Kryst., ii., 163; iii., 81, 1878.

Occurrence in New Mexico, *B. Silliman*, Am. J. Sc., III., xxii., 67, 1881.

TYREEITE. *Heddle*, Min. Mag., iv., 189, 1881. One and a half hundred weight of the carnelian marble of Tyree, Scotland, dissolved in sixteen gallons of dilute HCl left as a residue, thirty pounds sahite, a little scapolite and titanite, and some ounces of a red mud. By decantation, 1·91 grams of a powder of deep brick-red color was obtained. Of this mud sulphuric acid dissolved ·78 gram, leaving 1·13 insoluble. The last was analyzed, and decided to be an impure talc. The soluble portion yielded: Fe₂O₃ 38·22, Al₂O₃ 8·23, FeO 3·16, MnO 0·39, MgO 29·94, CaO 2·21, H₂O 12·47, P₂O₅ 4·71, SiO₂ 1·02 = 100·35. To this last obviously heterogeneous substance the new name is provisionally given. [Certainly no name ever given had less claim for recognition in the Science of Mineralogy.]

TYROLITE.—Min., p. 570; App. II., p. 57.

TYSONITE. *Allen* and *Comstock*, Am. J. Sc., III., xix., 390, 1880.

Forms the central portion of hexagonal crystals, sometimes an inch or more in diameter, showing the planes *O*, *I*, *i*-2. The crystals are for the most part altered to bastnäsite (see below). Cleavage basal distinct. H. = 4·5-5. G. = 6·12-6·14. Lustre vitreous to resinous. Color pale wax yellow. Streak nearly white. Analyses:

Ce*	La, Di†	F	
(2/3) 40·19	30·37	[29·44]	= 100·00.

* Atomic weight 141·2.

† Joint atomic weight, specially determined, 138.

This gives the ratio Ce + (La, Di) : F = 504 : 1·547, corresponding to the formula (Ce, La, Di)₂F₆. B. B. blackens, but does not fuse. In closed tube decrepitates, changes color to a light pink. Insoluble in HCl and HNO₃, but soluble in H₂SO₄, with evolution of HF. Occurs in feldspar near Pike's Peak, Colorado. Named after Mr. S. T. Tyson.

The crystals, of which tysonite sometimes forms a central zone, consist for the most part or entirely of *bastnäsite* (App. I., p. 2, also called hamartite by Nordenskiöld), which has arisen from the alteration of the original mineral. Cleavage wanting. H. = 4-4·5. G. = 5·18-5·20. Lustre vitreous to resinous. Color reddish brown. Streak light yellowish gray. An analysis (2/3) gave: Ce₂O₃ 41·04, (La, Di)₂O₃ 34·76, CO₂ 20·15, F *undet.*

The joint atomic weight of the three metals was determined to be 140·2, calculating part of the oxides to form normal carbonates, the remainder as metals, and estimating the fluorine by difference, the result is obtained:

(Ce, La, Di) ₂ O ₃	Ce, La, Di	CO ₂	F	
50·13	21·82	20·15	7·90	= 100.

This corresponds closely to the formula: [R₂]F₆ + 2[R₂]C₃O₃, which requires: (Ce, La, Di)₂O₃ 49·94, Ce, La, Di 21·32, CO₂ 20·07, F 8·67 = 100. Compare *parisite*, Min., p. 702.

ULEXITE, Min., p. 598; App. II., p. 57.—Chemical composition discussed, *How*, Chem. News, xxxv., 189, 1877; *Reynolds*, ib., p. 213.
Anal., Tarapaca, Peru, *Raimondi*, Min. Pérou, p. 263, 1878. Prov. Salta, Argentine Repub., *Kyle*, Anal. Soc. Cientif. Arg., x., 169, 1880.
 Occurs in Kern Co., Cal., *Blake*, Am. J. Sc., III., xxii., 323, 1881.
 See also *Franklandite*, p. 48.

ULLMANNITE.—Min., p. 73; App. II., p. 57.

URANINITE, Min., p. 154; App. II., p. 57.—Occurrence in Mitchell Co., N. C., *Kerr*, Am. J. Sc., xiv., 496, 1877; *Hidden*, ib., xxii., 22, 1881.

Occurs in small brilliant octahedral crystals, G. = 9.22–9.23, at Branchville, Conn., *Brush* and *E. S. Dana* (Am. J. Sc., III., xvi., 35, 1878); analysis ($\frac{2}{3}$) by *Comstock* (ib., xix., 220, 1880): U 81.50, Pb 3.97, Fe 0.40, O 13.47, H₂O 0.88 = 100.22. After the determination of the amounts of UO₂ and UO₃, the analysis becomes:

UO ₃	UO ₂	PbO	FeO	H ₂ O	
40.08	54.51	4.27	0.49	0.88	= 100.23.

This corresponds to the formula: 3R^{iv}O₂ + 2R^{vi}O₃, with R^{iv} = \bar{U} , Pb₂Fe₂, and R^{vi} = \bar{U} . B.B. the mineral reacts with fluxes for uranium, and on reduction yields a globule of lead. In the closed tube gives off traces of water, which has a slightly acid reaction, the cause of which is not explained.

Uranocircite. *Weisbach*, Jahrb. Berg.-Hüttenwesen, 1877, Abhandl., p. 48.

Orthorhombic; form similar to that of autunite. Cleavage basal highly perfect; macrodiagonal and brachydiagonal distinct. G. = 3.53. Color yellow green. Optically biaxial. Acute bisectrix coincides with *c* (vert.); axial angle = 15°–20°.

Composition: BaU₂P₂O₁₂ + 8aq = P₂O₅ 14.00, UO₃ 56.75, BaO 15.07, H₂O 14.18 = 100. Analysis, *Winkler* (l. c.):

P ₂ O ₅	UO ₃	BaO	H ₂ O	
15.06	56.86	14.57	13.99	= 100.48.

Earlier analyses by *Georgi*, and *Uwao Imai*, gave confirmatory results. *Church* (Min. Mag., i., 234, 1877) finds, that *in vacuo* over H₂SO₄, at 20° C., 6aq go off; and the remainder (2aq) at a red heat. Occurs in quartz veins near Falkenstein, Saxon Voigtland. Formerly called autunite (lime-uranite).

URANOPHANE.—Min., p. 805; App. II., p. 57.

URANOSPHERITE.—App. II., p. 57.

URANOSPINITE, App. II., p. 58.—In tabular crystals, combinations of *O*, $\frac{1}{2}\bar{i}$, and $\frac{1}{2}\bar{l}$, with two undetermined domes. $O \wedge \frac{1}{2}\bar{i} = O \wedge \frac{1}{2}\bar{l} = 124^\circ 28'$; *c* (vert.): *b*: *a* = 2.9123 : 1 (approx.): 1. *Weisbach*, Jahrb. Berg. Hüttenwesen, 1877, Abhandl., p. 46 (Z. Kryst., i., 394). Contains, perhaps, 10aq (not 8aq), according to *Church*, Min. Mag., i., 236, 1877.

Uranothorite.—See *Thorite*, p. 121.

URANOTIL, App. I., p. 16; II., p. 58.—Occurs at the "Weisser Hirsch" mine, at Neustädte, Saxony. In capillary crystals and crystalline groups, also massive, with fine fibrous fracture. G. = 3.814–3.898. Analyses: 1, 2, *Winkler*:

	SiO ₂	UO ₃	Fe ₂ O ₃ *	CaO	H ₂ O	
1.	13.02	63.93	3.03	5.13	14.55	= 99.66.
2.	14.48	62.84	2.88	5.49	13.79	= 99.48.

* With tr. aluminum and cobalt oxides.

The formula deduced (that of *Boricky*) is Ca[U₂]₃Si₃O₁₆ + 9aq, which requires: SiO₂ 14.26, UO₃ 68.46, CaO 4.44, H₂O 12.84 = 100. *Weisbach*, J. Min., 1880, ii., 111.

Genth has obtained for uranotil, from Mitchell Co., N. C. ($\frac{2}{3}$): SiO_2 13.72, UO_2 66.67, Al_2O_3 , Fe_2O_3 tr., PbO 0.60, BaO 0.28, SrO 0.13, CaO 6.67, P_2O_5 0.29, H_2O 12.02 = 100.38, for which he calculates the formula: $\text{Ca}_3(\text{UO}_2)_6\text{Si}_6\text{O}_{21} + 18\text{aq}$, requiring: SiO_2 13.95, UO_2 66.98, CaO 6.51, H_2O 12.56 = 100. Amorphous. H. = 2.5. G. = 3.834. Amer. Chem. Journ., i., 88, 1879.

Ürvölgyite.—See *Herrengrundite*, p. 57.

Urusite.—See *Sideronatriite*, p. 109.

VAAHITE.—App. II., p. 58.

VALENTINITE, Min., p. 184.—On barite from Nagybanya, *Brun*, Z. Kryst., v., 105, 1880.

VALLERITE.—App. II., p. 58.

VANADINITE, Min., p. 184; App. II., p. 59.—**Cryst.**, Kappel, Carinthia, v. *Zepharovich*, *Lotos*, 1876 (J. Min., 1876, 561); Kappel, Carinthia, *Vrba*, Z. Kryst., iv., 353, 1880. *Cordoba*, *Websky*, Ber. Ak. Berlin, 1880, 799, and Z. Kryst., v., 542, 1881.

Analyses, Wanlock-Head, Dumfriesshire, *Frenzel*, Min. Petr. Mitth., iii., 504, 1881. *Cordoba*, *Rammelsberg*, Ber. Ak. Berlin, 1880, 661. Occurrence at Bölet, Sweden, *Nordenström*, Geol. För. Förh., iv., 209, 1878; anal. *Nordenström*, ib., iv., 267, 1879.

Occurrence in brilliant red crystals at the Hamburg, and other mines in the Silver District, Yuma Co., Arizona, *B. Silliman*, Am. J. Sc., III., xxii., 198, 1881. At the Castle Dome mines, *W. P. Blake*, Min. Sc. Press, Aug. 13 (Am. J. Sc., xxii., 410), 1881.

VANADIOLITE.—App. I., p. 16.

VANADITE.—Min., p. 610; App. II., p. 59.

Vanuxemite. *C. U. Shepard*, Contrib. Min., 1876. A product of the decomposition of zinc ores at Sterling Hill, N. J. Occurs in irregular patches in a firm ochery aggregate. Massive, with an even or conchoidal fracture. Color white; dull. H. = 2.5-3. G. = 2.5. Does not adhere to the tongue, but emits a slight clayey odor on being breathed upon. An analysis gave: SiO_2 35.64, Al_2O_3 11.70, ZnO 32.48-36.0, H_2O 14.80-19.88. [Obviously a mixture of white clay with hydrous zinc silicate, and hence not a mineral species.]

VARISCITE, Min., p. 582; App. II., p. 59.—The mineral called *peganite* from Montgomery Co., Ark., is shown by *Chester* (Am. J. Sc., III., xiii., 295; xv., 207) to be identical with the *variscite* of *Breithaupt* (Min., p. 582, and *Petersen*, J. Min., 1871, 357), and also with *callainite* of *Damour* (Min., p. 572). Occurs in crusts consisting of minute prismatic crystals, in sheaf-like aggregates; also amorphous. Observed planes: I , i , i' , i'' , O ; $I \wedge I = 114^\circ 6'$. H. = 4. Lustre brilliant. Color deep emerald green, bluish green to colorless. Transparent to translucent. B. B. infusible. Analysis (after deducting 70 and 50 p. c. quartz):

	P_2O_5	Al_2O_3	H_2O
($\frac{2}{3}$)	44.35	31.85	23.80 = 100.

This corresponds to the formula: $\text{Al}_2\text{P}_2\text{O}_8 + 4\text{aq}$, or the composition of *variscite*, according to *Petersen* (J. Min., 1871, 357).

Anal., *Helmhacker*, Min. Petr. Mitth., ii., 245, 1879.

Vasite.—See *Orthite*, p. 87.

Venasquite.—See *Ottrelite*, p. 87.

Venerite. *T. S. Hunt*, Trans. Amer. Inst. Min. Eng., iv., 325, 1876.

Occurs as a greenish, earthy-looking "clay ore," in irregular layers in the schists connected with the magnetite of Jones mine, near Springfield, Berks Co., Penn. The purer portions have a pea-green, or apple-green color when moist; becomes greenish white on drying, and falls to powder. Under the microscope is seen to consist mostly of minute, shining, transparent scales, with some impurities. Analysis by G. W. Hawes, on material purified by washing, gave: SiO_2 28.93, Al_2O_3 13.81, Fe_2O_3 5.04, FeO 0.27, CuO 16.55, MgO 17.47, H_2O 12.08, insol. 6.22 = 100.37. After deducting the insoluble portion, this becomes: SiO_2 30.73, Al_2O_3 14.67, Fe_2O_3 5.35, FeO 0.29, CuO 17.58, MgO 18.55, H_2O 12.83 = 100. Named in allusion to the alchemistic symbol for copper.

[The substance examined is so evidently wanting in homogeneity, that it cannot be regarded as a mineral species.]

VERMICULITE, Min., p. 493; App. II., p. 59.—Analyses (by Gooch) of varieties from Lerni, Delaware Co., Penn., and Pelham, Mass., and discussion of the relations of this group of minerals, *J. P. Cooke*, Amer. Acad. Sc., x., 453, 1875. Anal., Walney Island, North Lancashire, England, *Parke*, Proc. York. Geol. Pol. Soc., II., iv., 254, 1877.

A related mineral (decomposition product) is called **PROTOVERMICULITE** by *König* (Proc. Ac. Nat. Sc. Philad., 1877, 269). Micaceous structure. Optic-axial angle small. $H. = 2$. $G. = 2.269$. Color yellowish silvery to bronze. Analysis: SiO_2 33.28, Al_2O_3 14.88, Fe_2O_3 6.36, FeO 0.57, MgO 21.52, H_2O (combined) 3.36, H_2O (hygroscopic) 20.54, MnO , TiO_2 tr. = 100.51. *König* (l. c.) has also analyzed the jefferisite of West Chester, Penn.

Another related mineral, from Philadelphia, is called **PHILADELPHITE** by *H. C. Lewis* (Proc. Ac. Nat. Sc. Phil., Dec., 1879). Micaceous. $H. = 1.5$. $G. = 2.80$. Color brownish red. Inelastic, feel greasy; axial angle $31^\circ-39^\circ$. Analysis ($\frac{2}{3}$): SiO_2 35.73, Al_2O_3 15.77, Fe_2O_3 19.46, FeO 2.18, MgO 11.56, CaO 1.46, Na_2O 0.90, K_2O 6.81, H_2O 4.34, TiO_2 1.03, V_2O_5 0.37, MnO 0.50, NiO , CoO 0.06, CuO 0.08, P_2O_5 0.11, Li_2O , Cl , SO_3 , etc. tr. = 100.36. Another analysis by *Haines* gave: 38.79 SiO_2 , etc. The mineral is very hygroscopic, and on heating ($150^\circ-160^\circ$) expands to ten times its volume; a small fragment exfoliating raised 50,000 times its own weight. *Lewis* makes a series of careful experiments to determine at what temperatures the water is given off. *König* writes the formula for his mineral $\text{R}_3[\text{R}_2] \text{Si}_3\text{O}_{12} + \text{H}_2\text{O}$, and *Lewis* for his, $\text{R}_4[\text{R}_2]_2\text{Si}_5\text{O}_{20} + 2\text{H}_2\text{O}$; both are essentially the same as other varieties already described, except in the amount of water present. [As all the minerals of the group are, undoubtedly, decomposition products of other micas, the multiplication of names seems most undesirable.]

Vesbine. A name given by *Scacchi* to the material forming thin yellow crusts on the lava of 1631, Vesuvius, which is supposed to contain a new element called by him vesbium, Att. Accad. Napoli, Dec. 13, 1879.

VESUVIANITE, Min., p. 276; App. II., p. 59.—**Cryst.**, Albani Mts., showing variation in crystallographic constants, *Sella*, Z. Kryst., i., 251, 1877. Ural, *Tarassof*, Verh. Min. Ges. St. Pet., II., xiv., 139, 1879. *Groth* and *Bücking*, Min.-Samml. Strassburg, p. 199, 1878.

Thermo-electric character, *Hankel*, Pogg. Ann., clvii., 162, 1876.

According to *Mallard*, pseudo-tetragonal, and analogous to apophyllite (q. v., also App. III., p. 139), Ann. Min., VII., x., 133, 1876. See also *Brezina*, Min. Mitth., 1877, 98. *Döller* finds, from a discussion of many measurements, no decisive evidence against the tetragonal character of species, that is, on the morphological side, Z. Kryst., v., 289, 1881.

Anal., Tschamendorf, near Strehlen, Silesia (1.77 p. c. TiO_2), *Schumacher*, J. Min., 1878, 817. Jordansmühl, Silesia (3.2-3.4 p. c. MnO , manganidocrase), *v. Lasaulx*, Z. Kryst., iv., 168, 1879.

VESZELYITE, App. II., p. 59.—*Schrauf*, Z. Kryst., iv., 31, 1879. Triclinic, monoclinic in habit. Incrusting, consisting of a granular aggregate of indistinct crystalline individuals. Occasionally in distinct crystals, combinations of the prisms and brachydomes; $I \wedge I' = 109^\circ 15'$, $1-\chi \wedge 1-\chi' = 95^\circ 10'$. $H. = 3.5-4$. $G. = 3.531$. Color and streak greenish blue. Analysis (on 0.1 gr.):

As_2O_5	P_2O_5	CuO	ZnO	H_2O	
10.41	9.01	37.34	25.20	17.05	= 99.01.

Formula : $2(\text{Zn,Cu})_3\text{As}_2\text{O}_8 + 9(\text{Zn,Cu})\text{H}_2\text{O}_2 + 9\text{aq}$; with $\text{Cu} : \text{Zn} = 3 : 2$, and $\text{As}_2\text{O}_8 : \text{P}_2\text{O}_5 = 1 : 1$; this requires : As_2O_8 12·13, P_2O_5 7·48, CuO 37·68, ZnO 25·62, H_2O 17·08 = 100. Closely related in form and composition to libethenite and adamite. Occurs as an incrustation on granite, and on limonite, at Morawitz, in the Banat.

VICTORITE.—App. II., p. 59 (18).

Vietinghofite.—See *Samarskite*, p. 106.

VILLARSITE.—Min., p. 409; App. II., p. 59.

VIRIDITE.—App. II., p. 59.

VIVIANITE, Min., p. 556; App. II., p. 59.—Anal., white variety from Amers, Belgium, *Dewalque*, Ann. Soc. Geol. Belg.; iii., 3.

VOLBORTHITE, Min., p. 611.—Woskressenskoï, Perm in the Ural, Genth analyzed the coating on a quartzose rock, finding 85·55 p. c. insol. and 14·45 p. c. soluble, with 4·49 H_2O . The soluble portion yielded : V_2O_5 13·59, CuO 38·01, BaO 4·30, CaO 4·49, H_2O [31·60], SiO_2 1·36, Al_2O_3 4·78, Fe_2O_3 0·45, MgO 1·42 = 100. Neglecting the SiO_2 , Al_2O_3 , Fe_2O_3 , MgO , and a part of the water as impurities, Genth calculates : $(\text{Cu,Ba,Ca})_3\text{V}_2\text{O}_8 + 3\text{CuH}_2\text{O}_2 + 12\text{aq}$, requiring : V_2O_5 19·63, CuO 38·41, BaO 6·17, CaO 6·77, H_2O 29·02. A second analysis gave confirmatory results. Am. Phil. Soc. Philad., xvii., 122, 1877.

VOLTZITE, Min., p. 50.—Joachimsthal, optically uniaxial, positive, *Bertrand*, Bull. Soc. Min., iv., 59, 1881.

Vreckite.—See *Bhreckite*, p. 15.

WACKENRODITE.—App. II., p. 59.

WAD, Min., p. 181; App. II., p. 60.—Anal., Londonderry, N. S., *Louis*, Trans. Nov. Sc. Inst., iv., 427, 1878. New Caledonia (asbolite), *Liversidge*, Proc. Roy. Soc. N. S. W., Sept. 1, 1880.

A mineral near some varieties of wad, from Kamsdorf, Thuringia, is called LEPIDOPHÆRITE by *Weisbach* (J. Min., 1880, ii., 109). Structure fine fibrous and scaly. Very soft, soiling the fingers. $G. = 2·89-3·04$. Lustre silky, dull. Color and streak reddish brown, the latter shining. In closed tube becomes black. Soluble in HCl with evolution of chlorine. Analysis, *Jenkins* : MnO_2 58·77, MnO 9·59, CuO 11·48, H_2O 21·05 = 100·89, corresponding to $\text{CuMn}_2\text{O}_{12} + 9\text{aq}$, which requires : MnO_2 58·20, MnO 9·50, CuO 10·62, H_2O 21·68.

WAGNERITE, Min., p. 538; App. II., p. 60.—*Bauer* (ZS. G. Ges., xxvii., 230, 1875) suggests that KJERULFINE (App. II., p. 31) is probably identical with wagnerite, but more or less altered; later he shows that the identity is beyond question (J. Min., 1880, ii., 75). Analyses by *Pisani* (Bull. Soc. Min., ii., 43, 1879), *Rammelsberg* (ZS. G. Ges., xxxi., 107, 1879), *Friederici* (J. Min., 1880, ii., 77), agree in general with the wagnerite formula : $\text{Mg}_3\text{P}_2\text{O}_8 + \text{MgF}_2$. The form and optical characters have been studied by *Brögger* and *Reusch* (ZS. G. Ges., xxvii., 675, 1875), and *Brögger* (Z. Kryst., iii., 474, 1879), and a general correspondence with wagnerite finally proved.

Walkerite.—See *Pectolite*, p. 89.

WALPURGITE, App. I., p. 16; II., p. 60.—According to *Weisbach* (J. Min., 1877, 1) the crystals are triclinic, with pseudo-monoclinic symmetry, due to twinning. *Groth* confirms this by an optical examination, Z. Kryst., i., 93, 1877.

WALTHERITE.—See *Bismutite*, p. 15.

Walnewite.—See *Xanthophyllite*, p. 132.

WAPPLERITE, App. II., p. 60.—Cryst. and optical description, *Schrauf*, Z. Kryst., iv., 281, 1880.

WARWICKITE.—Min., p. 600; App. II., p. 60.

Wattevillite. *Singer*, Inaug. Diss. Würzburg, 1879, p. 18.

In very minute acicular crystals, orthorhombic or monoclinic; in part twins; forms fine fibrous aggregates. G. = 1·81. Color snow white. Lustre silky. Taste first sweet, then astringent. Analysis, after deducting 33·69 p. c. hygroscopic water :

SO ₃	Al ₂ O ₃	FeO	NiO	CoO	CaO	MgO	K ₂ O	Na ₂ O	H ₂ O	
44·01	0·24	0·88	1·05	1·30	16·87	2·49	4·74	10·46	17·73	= 99·77.

Calculated formula : $RSO_4 + 2aq$, very near polyhalite. B. B. swells up and fuses with difficulty to a white blebby enamel. Very soluble in water; from the concentrated solution, crystals of gypsum separate on standing, and still more quickly on warming. Found on lignite, associated with other related sulphates on the Bauersburg; near Bischofsheim vor dem Rhön, in Bavaria. Named after M. v. Watteville, of Paris.

WAVELLITE.—Min., p. 575; App. II., p. 60.

WERNERITE.—See *Scapolite*, p. 106.

Werthemanite. *Raimondi*, Min. Pérou, p. 244, 1878 (Domeyko, 5th Append. Min. Chili, 1876).

Massive, easily reduced to powder. G. = 2·80. Color white. Gives an argillaceous odor, and adheres to the tongue. Composition : $Al_2SO_6 + 3aq$. Analysis gave : SO₃ 34·50, Al₂O₃ 45·00, Fe₂O₃ 1·25, H₂O 19·25 = 100. B. B. infusible. Soluble in acids. It differs from aluminite only in containing less water. Found in a bed of clay near the city of Chachapoyas, Peru. Pyr. as with aluminite. B. B. infusible; after ignition gives a blue color with cobalt solution. Insol. in HCl, HNO₃ and aqua regia.

WESTANITE.—App. I., p. 16.

WHEELERITE.—App. II., p. 60.

WHEWELLITE.—Min., p. 718; App. II., p. 61.

WHITNEYITE.—Min., p. 37; App. II., p. 61.

WILLCOXITE.—App. II., p. 61.

WILLEMITE.—Min., p. 262; App. II., p. 61.

WINKLERITE.—App. II., p. 61.

WINKWORTHITE.—App. I., p. 17.

WISERINE.—Min., p. 528; App. II., p. 61.—See *Octahedrite*, App. III., p. 85.

WITTICHENITE.—Min., p. 98; App. II., p. 61.

WÖHLERITE.—Min., p. 291; App. II., p. 62.

WOLFACHITE.—App. I., p. 17.

WOLFRAMITE, Min., p. 601; App. II., p. 62.—Cryst. description, Felsöbanya, *Krenner*, Min. Mitth., 1875, 9.

With tin-stone at Inverell, New South Wales, *Liversidge*, Proc. Roy. Soc. N. S. W., Nov. 3, 1880.

WOLLASTONITE, Min., p. 210; App. II., p. 62.—Anal., Santorin, *Fouqué*, C. R., lxxx., 631, 1875.

WOLLONGONGITE, App. I., p. 17.—See *Torbanite*, p. 123.

WOODWARDITE.—Min., p. 666; App. II., p. 62.

WULFENITE, Min., p. 607; App. II., p. 62.—Occurrence in the silver district, Yuma Co., Arizona; sometimes in simple octahedral crystals, *B. Silliman*, Am. J. Sc., III., xxii., 203, 1881.

Schrauf has given the name CHROMOWULFENITE to some red wulfenite containing chromium, Ber. Ak. Wien, lxiii., 1871.

WURTZITE, Min., p. 59.—Anal., Przi Bram, *Frenzel*, J. Min., 1875, 678.

Description of artificial crystals, hemimorphic, like greenockite, *Förstner*, Z. Kryst., v., 363, 1881.

See also *Erythrozincite*, p. 43.

XANTHIOSITE.—App. II., p. 62.

Xantholite.—See *Staurolite*, p. 114.

XANTHOPYLLITE, Min., p. 508.—A variety is called WALUEWITE by v. Kokscharof (*P. v. Jeremejev*, Verh. Min. Ges. St. Petersburg, II., xi., 341, 355, 1876; *N. von Kokscharof*, Z. Kryst., ii., 51, 1877 (Min. Russl., vii., 346)).

Monoclinic in symmetry. Axes, $c : b : a = 3.2728 : 1 : 0.5768$. $\beta = 90^\circ 0'$. Observed planes : O , $-\frac{1}{2}i$, $\frac{1}{4}i$, $i-\frac{3}{4}$, $\frac{1}{2}$, $-\frac{1}{2}$, $\frac{3}{4}-\frac{3}{2}$; $O \wedge -\frac{1}{2}i = 109^\circ 28'$; $O \wedge \frac{3}{4}-\frac{3}{2} = 109^\circ 28'$; $-\frac{1}{2}i \wedge \frac{3}{4}-\frac{3}{2} = 109^\circ 28\frac{1}{2}'$; $O \wedge \frac{1}{4}i = O \wedge -\frac{1}{2}i = -\frac{1}{2}i \wedge \frac{3}{4}-\frac{3}{2} = -\frac{1}{2}i \wedge i - \frac{1}{2}i = 140^\circ 46'$; these angles correspond closely with the isometric system. Plane angle of the base 120° . Twins common, similar to those of mica; twinning-plane I . Cleavage: basal perfect. $H. = 4.5$. $G. = 3.093$. Lustre vitreous; on cleavage plane pearly. Color leak to bottle-green. Transparent to translucent. Strongly dichroic, parallel c (vert.) fine green, perpendicular to c (vert.) reddish brown. Optical properties (*H. Bücking*): axial plane the clinodiagonal section; bisectrix negative, inclined 32° to the normal (probable error not greater than $13'$). Axial angle about $20\frac{1}{2}^\circ$ ($20^\circ-40^\circ$ Des Cloizeaux, $\rho < v$). Analysis, *P. v. Nikolajef*:

SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MgO	CaO	H ₂ O	
16.90	43.55	2.31	0.33	17.47	13.00	5.07	= 98.63.

Found with perovskite and other species in chloritic schists in the mine Nikolaje-Maximilianowsk, near Achmatowsk, in the southern Ural. Named after the Russian Minister, *P. A. von Waluew*.

See also *Clintonite*, p. 28.

XENOTIME, Min., p. 528; App. II., p. 62.—Cryst., Binnenthal, *Klein*, J. Min., 1875, 369; *St. Gothard*, ib., 1879, 536.

Occurrence at Königshayn, Görllitz, Silesia, *v. Lasaulx*, J. Min., 1877, 174. Crystals compounded with zircon from Alexander Co., N. C., *W. E. Hidden*, Am. J. Sc., III., xxi., 244, 1881.

Anal., *Hitteröe*, *Schidtz*, J. Min., 1876, 306.

Youngite. *Hannay*, Min. Mag., i., 152, 1877; ii., 88, 1878.

A coarsely crystalline, apparently homogeneous mineral. $H. = 6$. Lustre metallic, resembling fractured cast-iron. A specimen of unknown source yielded *Hannay*, analyses 1,

2, 3, 4; and a specimen from Ballarat, Australia, gave Stewart and Hood, analyses 5 and 6 (mean of several):

	S	Pb	Zn	Fe	Mn	
1. G. = 3.62	28.85	20.92	40.07	....	11.13	= 100.97.
2. G. = 3.59	27.50	24.22	38.46	2.83	6.93	= 99.94.
3.	26.93	24.58	37.92	2.80	6.77	= 99.00.
4.	28.99	22.18	37.75	3.14	7.00	= 99.06.
5.	27.43	26.02	35.42	9.16	1.28, Sb 0.25, SiO ₂ 0.13	= 99.69.
6. G. = 4.56	27.28	25.73	36.62	8.73	1.30, SiO ₂ 0.10	= 99.76.

Corresponds approximately to a simple sulphide containing lead and zinc, with varying quantities of iron and manganese. Named after Mr. John Young, of Glasgow.

[The description of "Youngite" is very incomplete (note the disparity in the determinations of the specific gravity), and the composition is improbable. Analyses 1 and 2, for which separate formulas are given by the author, were obtained from the same specimen! Beyond question a mechanical mixture.]

YTTROKERITE.—Min., p. 625; App. I., p. 62.

Yttrogummite.—See *Cleveite*, p. 27.

YTTROTANTALITE.—Min., p. 519; App. II., p. 62.

ZARATITE, Min., p. 710.—From the mines of Rapi, Province de la Mar, Peru, *Raimondi*, Min. Pérou, p. 206, 1878.

ZEPHAROVICHITE.—App. I., p. 62.

ZEUNERITE, App. II., p. 62.—Cryst., and association with uranospinite, *Weisbach*, Jahrb. Berg.-Hütt., 1877, Abhandl., p. 45 (Z. Kryst., i., 394).

ZINC, Min., p. 17.—Reported as found in the native state in north-eastern Alabama, *W. D. Marks*, Am. J. Sc. III., xi., 234, 1876.

Zincaluminite. *Bertrand* and *Damour*, Bull. Soc. Min., iv., 135, 136, 1881.

In minute crystals, forming very thin hexagonal plates. Optically uniaxial, negative, and hence hexagonal, or possibly orthorhombic with $I \wedge I = 120^\circ$ nearly (*Bertrand*). $H. = 2.5-3$. $G. = 2.26$. Color white, or slightly bluish. Analysis, *Damour*, deducting a little clay associated with it:

SO ₃	Al ₂ O ₃	ZnO	CuO	H ₂ O	
12.94	25.48	34.69	1.85	25.04	= 100.

Formula: $2ZnSO_4 + 4ZnH_2O_2 + 3Al_2H_6O_6 + 5aq$, requiring: SO₃ 12.48, Al₂O₃ 24.12, ZnO 33.12, H₂O 25.28 = 100. B. B. in the closed tube gives off abundance of water. Slightly alkaline. With cobalt solution on strong ignition, gives a greenish-gray mass with blue at some points. On charcoal a zinc coating. Soluble in HNO₃, leaving 5 to 7 p. c. clay. From the zinc mines of Laurium, Greece.

ZINCITE.—Min., p. 135; App. II., p. 63.

ZINKENITE, Min., p. 88.—Anal., *Sendtner*, from Adlersbach, near Hausach, Kinzigthal, Ann. Ch. Pharm., clxxxv., 205, 1877.

ZINNWALDITE.—See *Mica Group*, p. 77.

Zircarbite. *C. U. Shepard*, Contrib. Min., 1877. A massive, compact, or cellular, yellowish-brown, opaque mineral. $H. = 2-2.5$. B. B. infusible. Chemical nature unknown. With erytolite, at the granite quarries of Rockport, Mass.

ZIRCON, Min., p. 272; App. II., p. 63.—Supposed to occur in microscopic twin crystals, *Meyer*, ZS. G. Ges., xxx., 11, 352, 1878; *Slapff*, l. c., xxx., 133; xxxi., 405, 1879; *Riess*, Min. Petr. Mitth., i., 203, 1878; *Hussak*, Min. Petr. Mitth., i., 277, 1878; this conclusion questioned by *Sauer*, J. Min., 1879, 569; *Rosenbusch*, Att. Accad. Torino, June 19, 1881.

Large twin crystal (1-*i* as twinning-plane), from Renfrew, Canada, *W. E. Hidden*, Am. J. Sc., III., xxi., 507, 1881; same observed by *L. Fletcher*, Z. Kryst., vi., 80, 1881. The crystals from Renfrew occur with gigantic titanite crystals (p. 122), and are sometimes very large. From various Italian localities, *Uzielli*, Accad. Linc. Mem., II., iii., 862, 1876.

Mallard (Ann. Min., VII., x., 143, 1876) includes zircon among the pseudo-tetragonal minerals.

Specific gravity determination, *Church*, Geol. Mag., II., ii., 322, 1875.

Anal., El Paso, Colorado, *König*, Am. Phil. Soc. Phil., xvi., 518, 1877, or Z. Kryst., i., 432.

Color due to state of oxidation of iron, and varied in R. F. and O. F., *Spezia*, Att. Acc. Torino, xii., 37, 1876.

A variety of zircon from Ceylon is called BECCARITE by *Grattarola* (Att. Soc. Tosc., iv., 177, 1879). Color olive green. Optically biaxial, with apparently twinned structure; a basal section is divided into four sectors in polarized light. Form and other characters like zircon. Analysis: SiO₂ 30.30, ZrO₂ 62.16, Al₂O₃ 2.52, CaO 3.62, ign. 0.30 = 98.92. Named for Dr. O. Beccari.

See also *Cyrtolite*, p. 33.

ZIRLITE.—App. II., p. 63.

ZÖBLITZITE, App. II., p. 34.—*Anal.* (a white serpentine), *Frenzel*, J. Min., 1875, 680.

ZOISITE, Min., p. 290; App. II., p. 63.—*Anal.*, Syra, *Lüdecke*, ZS. G. Ges., xxviii., 258, 1876. Leiperville, Delaware Co., Pa., *König*, Proc. Ac. Nat. Sc. Philad., 1878, 83.

Cryst. (thoullite), Souland, Norway, *Brögger*, Z. Kryst., iii., 471, 1879.

Crystallographically and chemically investigated by *Tschermak* and *Sipőcz* (Ber. Ak. Wien, lxxxii., 141, 1880). The measurements (of crystals from Ducktown, Tenn., by *Becke*) confirm the accepted orthorhombic character. The optical characters are peculiar, in consequence of the presence of twin lamella. An analysis of transparent crystals from Ducktown, by *Ludwig*, gave: SiO₂ 39.61, Al₂O₃ 32.89, Fe₂O₃ 0.91, Fe 0.71, MgO 0.14, CaO 24.50, H₂O 2.12 = 100.88. This corresponds to the already accepted formula: H₂Ca₄[Al₂]₃Si₆O₂₆, analogous to that epidote, in which [Fe₂] takes the place of [Al₂]; between the two various intermediate compounds exist, according to the extent to which the iron and aluminum respectively replace each other.

ZONOCHLORITE.—See *Prehnite*, p. 96.

ZORGITE, Min., p. 43.—Analyses of related minerals (Pb,Cu)₂Se, and (Cu,Pb)₂Se₂, from the Andes, *Pisani*, C. R., lxxx., 391, 1879.

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